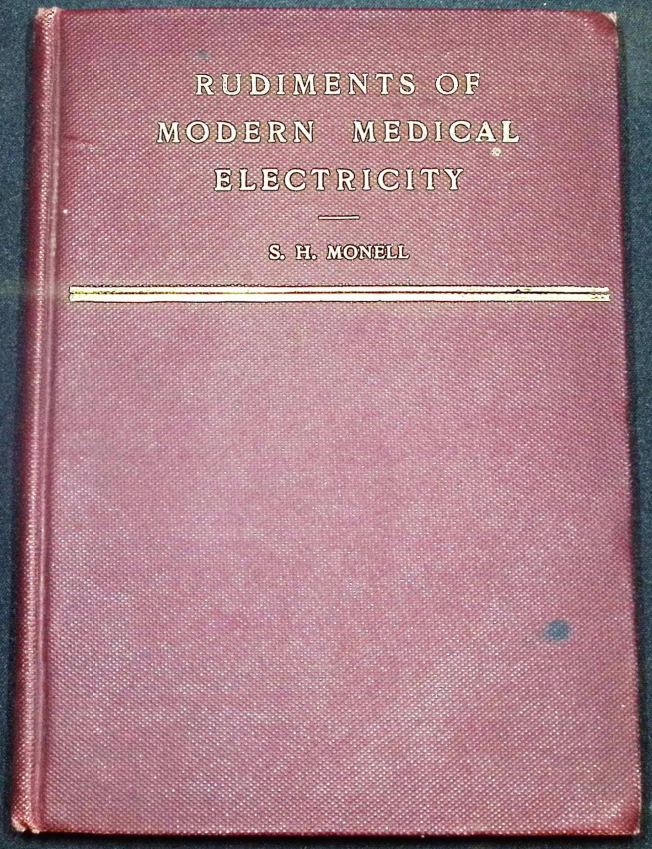

RUDIMENTS OF
MODERN MEDICAL
ELECTRICITY
S. H. MONELL

Mrs. Campbell

Pattos Cal

July 5, 1901

RUDIMENTS

OF

MODERN MEDICAL ELECTRICITY.

LIST OF DR. MONELL'S BOOKS,

Published By E. R. PELTON.

Treatment of Disease by Electric Currents.

1100 pages, octavo, cloth. Price, net, $7.50.

"The most complete, progressive and valuable book of practical instruction ever written on the uses of Medical Electricity."

Static Electricity in X-Ray and Therapeutic Uses.

670 pages, octavo, cloth. Price, net, $6.00

Elements of Correct Technique.

320 pages, octavo, cloth. Price, net, $2.50.

Rudiments of Modern Medical Electricity.

175 pages, 12mo, cloth. Price, net, $1.00.

The Cure of Writers Cramp and the Arm Troubles of Telegraphers and Ball Players.

55 pages, octavo, paper. Price, net, 50 cents.

The published Electro-therapeutic volumes written by Dr. Monell have now reached the remarkable aggregate of 17,500 copies. To this proof of the popular merit of these books, the publisher has nothing to add, as the large sale indicates the value of these practical HELPS to physicians who use any kind of Medical electricity. While it is frequently said that this author's works hold the interest of the reader from cover to cover, yet their value lies in the great amount of clinical instruction they contain. The physician who has had any experience at all with electricity can treat his patients from the clear directions in "The Treatment of Disease by Electric Currents."

"Elements of Correct Technique" is a clinical supplement to the work on "Treatment," and should be in the hands of every owner of an electrical apparatus. "The Manual on Static Electricity" is too well known to require comment.

The publisher takes special pride in being able to offer this important list of electro-therapeutic writings to the medical profession. Any volume of the series will be sent by mail or express to any address on receipt of price.

RUDIMENTS

OF

MODERN MEDICAL ELECTRICITY.

ARRANGED IN THE FORM OF

Questions and Answers

PREPARED ESPECIALLY FOR STUDENTS OF MEDICINE.

BY

S. H. MONELL, M. D.

(New York.)

Professor of Static Electricity in the International Correspondence Schools; Founder and Chief Instructor of the New York School of Special Electro-therapeutics; Member of the New York County Medical Society; Member of Kings County Medical Society; Charter Member of the Roentgen Society of the United States; Formerly Editor of the Electro-therapeutic Department of the Medical Times and Register, 1894–8; Author of "The Treatment of Disease by Electric Currents"; "Manual of Static Electricity in X-Ray and Therapeutic Uses"; "Elements of Correct Technique"; "The Cure of Writers Cramp and the Arm Troubles of Telegraphers and Ball Players"; etc., etc.

NEW YORK:

EDWARD R. PELTON, PUBLISHER

No. 19 East Sixteenth Street,

1900.

Entered according to Act of Congress, in the year 1900, by
F. W. MONELL,
In the office of the Librarian of Congress, at Washington, D. C.

[*All rights reserved.*]

PREFACE.

Medical electricity is 150 years old. Its literature is historic, but much of it is now obsolete and would confuse the student. To the beginner it presents a maze of contradictions, with but little of living and useful interest. The subject has also suffered from crude compilations by writers without proper experience to weigh facts, and who have repeated errors numberless and unfortunate. An expurgation is impossible. Therefore old editions of electrical books are not fitted for the student until the experience of after years enables him to sift the wheat from the chaff.

It is especially due the living generation of patients that medical students should graduate with an unbiased knowledge of the actual facts now known about the rational therapeutics of scientific electric currents. No existing treatise presents this needed information condensed for undergraduate study with a systematic exclusion of the obsolete and unnecessary. In preparing a Question-Compend for this purpose the author recalls his own gropings as a medical student, and here aims to supply what he then sought in vain; while as a veteran teacher of electro-therapeutics he also endeavors in these brief pages to establish the foundation

judgment of the undergraduate so that later studies of modern text-books may be freed from perplexity and misunderstanding.

It is considered far more important to teach the medical student a sound general view of the subject, than to tax his memory with details which have their place in laboratory experiments rather than in the lecture room. The author therefore wisely omits descriptions of mechanism, routine experiments, and the work of a laboratory or clinical course, and supplies what the student needs first.

S. H. MONELL.

New York, October 10, 1900,
No. 47 West 27th Street.

TABLE OF CONTENTS.

	Page
WHAT IS ELECTRICITY?	11
WHAT IS MEDICAL ELECTRICITY?	17
ELECTRO-THERAPEUTIC PRESCRIBING,	31
ELECTRO-PHYSICS,	50
ELECTRO-PHYSIOLOGY,	50
Galvanic Currents,	59
Electro-Diagnosis,	88
Galvanic Equipment,	94
Faradic, " "	97
Faradic Currents,	101
Sinusoidal Currents,	109
Static Electricity,	109
ELECTRO-THERAPEUTICS,	122
General Indications,	125
Summary of Uses and Value of Selected Currents in Special Diseases,	126

RUDIMENTS

OF

MODERN MEDICAL ELECTRICITY.

WHAT IS ELECTRICITY?

What is Electricity?

Its essence is unknown.

What is known about it?

Its laws and actions are very fully known.

What is the accepted definition of Electricity?

No statement in words defines electricity to the ordinary mind.

Is any definition of electricity practical?

No. All definitions have been theoretical and none can be demonstrated.

Is electricity singular in this respect?

No. Gravitation, heat, Mind, and various phenomena of "nature" are equally undefined as to essence but are easily made useful through man's knowledge of their laws of action.

Has electricity the physical properties of matter?

It has neither momentum or inertia, and presents no evidence of existence till it is "excited" by chemical or mechanical action.

When Electricity is "generated" or set into action, what does its behavior resemble?

It behaves like an "elementary force" with mixture of mechanical and chemical actions.

Can these actions be controlled and regulated?

Yes.

How?

By the aid of mechanical devices which direct, measure, control and regulate the uses of electricity as completely as other appliances regulate the uses of water, gas, stem, heat and machinery in general.

Is there more than one kind of Electricity?

No.

Is the electricity of the telephone, electroplating, the trolley car, electric motors the storage battery, medical electricity and Lightning, all one "Electricity?"

Yes, in essence; just as water in a basin, a brook, a goblet, a tea-kettle, as hose pipe, a canal, a cataract, a flood, or as rain, vapor, ice, steam, fog, boiling, cool, or cold, in motion or at rest, in the thin spray of hypodermic needle or the torrent of Niagara, is essentially the same element—water—under different *conditions*.

Who demonstrated this unity of electricity?

Faraday.

Has it confused the subject of Medical electricity?

Yes. Very much.

How?

Men who have read so far but no farther have concluded that all electric currents were also alike in their actions and uses.

Is this idea a mistake?

It is just as great a mistake as would be the conclusion that because all water is H_2O we could run a mill with the water of a level pond, or float a ship with the water in a hose pipe, or do hydraulic mining with the water in a block of ice.

Do the conditions under which electricity is employed affect its action and the kind and quality of the work it will do?

Yes. The principle is the same as the principle of altering the work air and water will do by altering the conditions of forcing them into action.

When electricity is forced into action what is it called?

An electric current.

Can electricity be in a state of "rest"?

Temporarily, yes.

What is it then called?

An "Electro-static Charge."

Can any practical use be made of a passive Charge?

No. To do work Electricity must be in motion.

Was this always known?

No. The celebrated Benjamin Franklin abandoned his studies of electricity because he "could find no way to make it useful." He studied "charges" and "discharges" but he had no knowlege of "currents."

When did the development of electricity in the form of what is called a flowing current really begin?

With the remarkable researches of Michael Faraday, the true forerunner of Edison and modern electrical science.

Did Faraday discover that an electric charge would "flow" along a conductor?

No. It was discovered many years before, and Volta, Galvani, Davy, and others had made many experiments, but Faraday was the chief builder of the scientific foundation on which modern electrical machinery has been constructed.

Should the medical student know the historic landmarks of electrical development?

Yes. As certainly as he should know the epochs of historic medicine.

Name the chief mile-stones in electrical history.

500 B. C., Thales observed that amber when rubbed would attract light bodies. Dr. Gilbert, in 1600 rediscovered and started "electricity" on its living and new career. Electricity was still merely a charge, a small spark, and exhibits of attraction and repulsion of light bodies.

1730 Grey discovered "conduction."

1745 Leyden jar invented. Small Static machines begin practical career.

1752--6 Franklin's experiments with small static machine and kite tests of lightning.

1750 to 1800 Static electricity use extensively in

medicine, the first and for fifty years the sole actual work performed by "electricity."

1790 to 1800 Galvani and Volta lay the foundations of the "galvanic battery" and give "current" electricity to the world.

1800 to 1810 Sir Humphrey Davy developes "Electrolysis" with Galvanic currents.

1820 Oersted's discovery leading to the "galvanometer."

1827 Ohm's law demonstrated.

1831--40 Faraday's induction coil and the laws of "induction."

1837 Copley medal to John Frederick Daniell for "his invention of the first form of galvanic battery cell which made it possible to maintain a fairly constant current for a long period of time. The Daniell 'Gravity cell' made the electric telegraph a commercial possibility."

1825 Sarlandierre was the first to employ electro-puncture needles.

1843 Technique of local and general faradization takes shape.

1845 Duchenne era of Faradic development begins. Died 1871.

1855 Remak era of Galvanic therapeutics begins. Died 1865.

1837--53 The great tests of Static electricity in Guy's Hospital, London.

1839 Crussel, the founder of electrolytic treatment, began his investigations.

1845 Heider successfully used galvano-cautery.

1859 Dr. B. W. Richardson published his demonstrations of cataphoresis.

1865 Modern type of Static machine invented. Greatly improved in 1885.

1885 to 1895 Scientific Electro-Gynecology developed.

1896 Roentgen's announcement of the X-Ray.

1875 to 1900 The great quarter-century of scientific electrical development in all lines, the era of applied electricity, the age of turning to use the laws and deductions of the great investigators and philosophers of the century preceding.

Not only Industrial but Medical electricity also is now established on a broad scientific foundation, and only waits for physicians in general to acquaint themselves with the facts already known.

What are some of the fundamental "laws" of electric action?

1. Like electricities attract; opposite electricities repel. (18th. century).

2. A magnetic needle tends to set itself at right angles to a wire through which a galvanic current is passing. (Oersted, 1820.)

3. Electricity always takes the path of least resistance.

4. The amperage of the current is equal to its voltage divided by the resistance of the circuit. (Ohm's law, 1827.)

Are there any exceptions to these laws?

No.

What is the importance of these laws?

They are the basis of all scientific electrical development, both medical and industrial, upon them resting already an investment of more than a thousand million dollars in this country alone.

WHAT IS MEDICAL ELECTRICITY?

Before taking up the study of separate electric currents what should the medical student first obtain?

A general comprehension of the subject of medical electricity and its development.

How is the general word "electricity" to be regarded?

In the same category as the general word "medicine."

Would you tell a patient to "try electricity" for any disease? Would that be proper prescribing?

No.

Why not?

Because it would be as indefinite as to tell a patient to "try medicine" without prescribing what particular medicine and dose.

But medicines are many and various: is electricity subdivided into many and various remedies?

Yes.

How?

By the different *mechanisms* of different types of batteries, which alter the qualities of currents so as to impart to complex electricity as a whole as many qualities and varieties of therapeutic action as if it was composed of twenty or more leading drugs.

What does the term "Electro-therapeutics" signify?

Exactly what Drug-therapeutics signifies, in principle.

If a sick person with no knowledge of medicine buys a battery and applies any form of current to himself, is that electro-therapeutics?

No. No more so than his buying an unknown nostrum at a store and taking it haphazzard, would exemplify scientific drug-therapeutics. The principle is the same.

What is an "Electro-therapeutist"?

A regularly graduated physician who to his general knowledge of disease, diagnosis, materia medica and the principles of utilizing the actions of drugs and other remedies in the treatment of morbid states has acquired, also by instruction and experience a special knowledge of the physiological and therapeutic actions of electric currents and the means of their scientific employment as remedial agents.

In what respect does such a physician differ from the average practitioner?

Only that in addition to the full medical resources of the one the other adds the resources of medical electricity.

Is this a very valuable addition?

In nearly one half of the entire field of medicine and surgery, the skilled addition of electro-therapeutics to other practical therapeutics could be made to add nearly fifty per cent to the average of clinical results.

Could this be done with one battery?

No. Nor with any number of batteries without training, and study of the subject.

Which is the most important medical current?

This is like asking which is the most important garment in a gentleman's wardrobe. Can he get along without the galvanic current, his shoes? Yes, but when he walks on stones he will miss the shoes, and in polite society their absence would count against his standing. Can he spare his coat, the faradic current? Yes, but all winter long he would be at a disadvantage without it. Considering the Static current analogous to trousers in their importance in a wardrobe, would they be missed? In this city they would. There are many men who would not spare their trousers from a complete wardrobe. And the shirt, the Sinusoidal current, would it be negligible if shoes and coat were intact? No. The separate currents of electricity are complementary to each other, just as only a full complement of garments makes a well-dressed man; or as a knife, fork and spoon at the dinner table are all required in eating a mixed diet.

But can a physician make no proper use of electricity until he possesses all types of apparatus?

As well ask if no drugs can be dispensed by a druggist until he has a complete stock of all drugs. Skill with any one current adds it to the physician's resources; skill with two currents adds two varieties of electricity. As each is mastered it becomes available at once for use and as practice developes along certain lines, certain currents will prove more frequently needed than others. The extent of individual equipment then settles itself according to individual practice.

Which type of battery should a beginner buy first?

This question perplexes so many students and even older practitioners that it cannot be evaded here. In a scientific sense there is no precedence. Cheapness, safety, wide range of possible use, and the extensive training required to develop a high degree of manual skill in technique, all suggest that a beginning may well be made by purchasing a scientific "induction coil" apparatus.

Is it possible to obtain a complete understanding of the true merits of any one current without making a comparative study of other currents?

No.

Is it wise to advise patients to treat themselves with electricity?

It is just as wise as it would be to request them to prescribe for themselves from the materia medica.

Why cannot the laity use electricity for self treatment?

For the same reason that they cannot wisely prescribe drugs. They lack all that a medical education has supplied to the mental equipment of the physician, and are not fitted by knowledge to act the part of the physician.

Can a nurse make satisfactory use of electricity?

Under the direction of a medical attendant who knows how to prescribe the different electric currents a nurse who has been properly taught the essentials of physiological action, dosage and technique, and is furnished with proper apparatus and electrodes, can carry o

the details of the prescription. This may often be advisable, but the common practice of letting an untaught nurse use an unscientific and inadequate battery on a patient should fast become obsolete. The well educated modern physician should do better than to foster this mild form of quasi-reputable quackery.

We are taught that there is but one "electricity": what then is meant by the terms "Medical electricity" and "Surgical electricity"?

Numerous terms of various kinds are applied to Electricity to signify the use to which it is put and the type of action employed.

What do we understand by the term "Medical electricity"?

This term signifies the qualities and varieties of certain electric currents, which are so modified by the construction of apparatus that they can be caused to set up actions in the living tissues which are alliedin character, and effects to the therapeutic actions of other important materia medica in the treatment of diseased conditions.

Why is any "Electricity" called Surgical electricity?

This term is applied to those modifications of certain currents which transfer their active effects from the nature of medicinal action to actions related to the operative procedures of surgery. The term is applied in practice only to such actions as are substitutes for other means of destroying tissue.

What two forms of apparatus furnish Surgical electricity?

The "cautery" battery, and the galvanic.

Is the galvanic current also used medically?

Yes, but by other methods and dosage.

Is the cautery battery also used as Medical electricity?

No. It cannot be so used as a cautery, (but a modification in construction of the apparatus gives us the galvanic current for medical uses.)

Is Surgical electricity an "exact science"?

As much so as any branch of surgical work.

Is Medical electricity an "exact science"?

More so than drug-therapeutics, for the reason that the laws of electricity are exact laws more fully understood and more exactly applied than are any known laws of drug action.

How long has Medical electricity been an "exact science"?

The pathological side of it is not yet an exact science, and will not be till the Practice of Medicine become an exact science, but great exactness in the study of physiological actions, and the dosage and modification of currents to exactly reproduce them has been developing gradually since the invention of the Leyden jar in 1745. Certain points of investigation reached permanent exactness in the eighteenth century, others during the first half of the nineteenth, and each decade of modern times has contributed to the great sum of exact electrotherapeutic knowledge that the world now has at its command.

State approximately the extent of the sum total of this knowledge to date?

It is so extensive in scope that for any one man to acquire it and use it with proper skill, would about equal

the task of becoming expert in any other great department of general medicine with the special addition of practical skill in all the minor branches.

Is it to be expected that any one physician will attempt to acquire the whole of this demonstrated knowledge?

It is no more to be expected than that any one physician will attempt to combine general practice with all the special knowledge of the surgeon, the neurologist, the dermatologist, the oculist, etc., etc.

But is it not true that in order to rationally employ medical electricity in the treatment of diseases the student must first become a competent general physician?

Yes, just as all other developments of special skill in medical practice are built on the foundation of general medical knowledge.

In what respect is a person who is not first a physician limited in his attempts to use electricity?

He is limited by his lack of knowledge of diagnosis, pathology, materia medica, the actions of drugs, and the principles of applied therapeutics.

Is such knowledge essential to the scientific prescribing of medical electricity?

It is absolutely essential.

Electricity then is to be regarded as an intrinsic part of essential materia medica?

Yes, as much so as quinine, strychnine, iron, mercury, digitalis, water, heat, aconite, arsenic, and other therapeutic agents.

In what esteem is Electricity entitled to be held by the medical profession ?

In the same high esteem that is accorded to any twenty of the leading drugs in medical practice.

Should the student regard Electricity as a remedy to be prescribed to the exclusion of drugs and other remedies ?

No. As soon regard quinine as a sole remedy to the exclusion of all other drugs.

Should the competent physician then use all means at his command which will benefit his patient best, without prejudice and with an eye single to his patients' good ?

Yes. That is the only scientific attitude in therapeutics.

But may not some special action of a selected electric current be our only means of producing the needed therapeutic effects in certain cases ?

Yes. There are some important actions that can be set up in the tissues with electricity that cannot be set up by any other remedial agent.

May not some selected action of an electric current also at times supplement the action of another remedy which is major to it in the given case, and thus hasten or increase the benefit to the patient ?

Yes, this helpful function of medical electricity is of daily service in practice.

Can electricity sometimes be the chief and most direct remedy in a given case without meeting the entire indications ?

Yes, this is often the case, both with electricity and

with drugs, and the same is true of surgery which often needs the aid of medicine to complete the restoration of the patient.

In such cases what should the physician do?

He should prescribe any or all adjuvant remedies.

Are any remedies incompatible with electricity?

No. There is no therapeutic antagonism between electricity and drugs.

Suppose that an indicated drug was properly prescribed by one physician and that another physician made a proper administration of indicated electricity; could the two remedies conflict and render the patient liable to injury under any circumstances?

No. No injurious effects are possible under these circumstances.

But injury can be caused by electric currents?

Yes. Mercury, arsenic, carbolic acid, aconite, all poisons, and even non-poisonous remedies have been harmful in overdoses and when mistakenly used. No skilled modern physician expects to now harm his patient with accurately dosed poisons, and the greatest drugs are the greatest poisons.

Is electricity as safely prescribed as drug remedies?

It cannot be less safe when prescribed with equal care and skill. Many applications of electricity have no limitations to their absolute safety; others are safe under all rational therapeutic conditions but are susceptible of abuse. The net liability of harm to a patient in the entire field of scientific electro-therapeutics is exceedingly

small. It can be wholly avoided by the simplest degree of skill.

But independent of actual harm does not electricity usually hurt patients?

No. Thousands of untaught persons among the laity, quacks, nurses, and even the medical profession have used electrical apparatus without knowing how, and have hurt a great many people to the lasting prejudice of this noble agent. Imagine the same complaint made against massage and you will at once observe that the masseur who hurts a patient must do it by faulty technique. Massage is not designed to pain the patient, neither is electricity. When employed with proper technique some of the effects of electricity are caused without any sensation to the patient; some cause mild sensations to which the patient is indifferent; a few indicated actions momentarily test the tolerance of certain tissues, but are agreeably supported when fully indicated; many of the uses of electricity relieve pain, and none should cause it; a great part of skilled electrical treatment is a positive pleasure to the patient. No other remedies prompt so many earnest expressions of gratification on the part of suffering patients.

What is the chief reason why non-experts "hurt" with electricity?

Unregulated dosage.

What is another reason?

Untaught technique.

Can you name another reason?

Selection of current and method is not suited to the indications. This common fault is allied in character to applying iodine to a burn, or prescribing hot fomen

tations to a frozen foot, or active motion for an inflamed joint, or a grain of strychnine for a simple tonic, or fifty grains of quinia sulph. to aid digestion. Such practice would be on a par with untrained employment of electrical currents.

Is there any other reason?

Yes. The use of crude currents from coarsely made batteries, or batteries which have been allowed to get out of proper order. Improper electrodes are also often a fault.

Is there such a thing as "Animal Electricity?

Yes. Certain fishes, the torpedo and gymnottis have special electric organs from which they can produce a discharge similar to a small Static spark. It is probably a weapon of defense from attack.

But is the human body, in itself, the seat of intrinsic electric currents?

Not in any practical sense.

Was it not long supposed that electricity resided in nerves and muscles—in a static condition when they were at rest; in a state of current action during muscular work, etc.?

Yes. The idea originated in Galvani's observations on the legs of frogs.

Who sought to prove that Galvani and Volta were both right and wrong?

The celebrated Humboldt in 1799 published experiments showing that Galvani was right in his main idea, but wrong in supposing that animal electricity was the only form of electricity, and showing that Volta was mistaken in denying its existence.

Who made the chief researches in this field?

Beginning about 1830 and continuing for a number of years, the great researches of Matteucci and Du Bois-Reymond overshadow all others.

What did they think they proved?

They worked with great ingenuity and persistence, and arrived at nine elaborate conclusions which are now obsolete.

Is it worth while for the student to memorize these conclusions about the presence and phenomena of so-called animal electricity?

No. They are omitted from this book because they have no practical value.

Why has modern investigation discarded these once accepted conclusions?

Improved instruments and more accurate methods have shown that they rested on a fictitious basis.

Then there is no state of electrification inherent in the human body?

There is none.

Can any person, sick or well, have or hold any "electricity" in themselves?

No. Not unless it is supplied by the usual external means, as during electrical treatment.

Could any person be "full of electricity" while walking about?

No.

Why not?

The body is a conductor and electric charges escape from conductors to the earth at the instant of contact.

Could not this be prevented?

Only a brief time by the most complete insulation.

Could a person be so completely insulated that a charge would not escape from the body?

Not by any known means.

Not even if sealed in glass or hard rubber?

No. It is impossible to confine electricity in storage in the human electrolyte.

Can an artificial electric charge be set up and maintained?

Yes. By active "electrification" on the insulating platform of the Static machine, as during ordinary treatment by this means.

Is this the only way it can be done?

Yes.

But is this "electrification" a fixed charge?

No. It is a current passing into the tissues, restrained by the resisting environment from direct conduction outward and onward, and accumulating under resisting pressure till an excess pushes out through the air to the earth at all points where the resistance is most easily broken apart.

Under ordinary circumstances, then, can it be demonstrated that any person has any electricity "in" them at all?

No.

Then what does the average physician mean when he tells a nervous patient that she "has too much electricity in her already"?

There is no scientific explanation of such a statement.

Has it any foundation in fact?

None has been demonstrated.

From the medical standpoint could it possibly be true?

No.

Why not?

Because no person, sick or well, has any electricity in them at all unless they are in actual contact in the circuit of a battery current.

Would it be proper for you to inform a nervous patient of yours that she had too much electricity in her already, and that electricity would do her more harm than good?

Certainly not. The facts are the reverse.

Is electricity, then, especially beneficial in cases of neurasthenia?

Yes. Provided that the principles of prescription, administration and dosage are as carefully regarded as they are in drug therapeutics.

Are the chief qualities of a battery "convenience and cheapness"?

No. Batteries can be both "convenient and cheap" and lack all the essential qualities of scientific therapeutic apparatus.

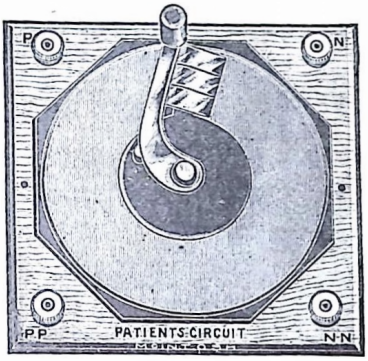
What are more important considerations in a battery?

In each type of electrical battery the prime consideration must be proper construction, regardless of cost.

What are the essentials of proper construction?

The mechanical details will depend on the type of current, but in general a battery must provide by its workmanship the proper medical qualities of its current, a sufficient range of dosage for its therapeutic purposes, the means of varying and regulating dosage to meet every indication that can be met by the type of current,

and must be so finely constructed that it will keep in working order with reasonable care. No one would state that the chief qualities of drugs should be "cheapness and convenience," and electricity must always be regarded from the viewpoint of medical actions which are related to drug actions in therapeutic properties.



Rheostat.

Why is the cheap so-called "Family battery" not a therapeutic instrument?

It does not provide the essentials of current quality and dose regulation mentioned above.

What type of current has this battery?

A coarse induction coil current.

What are the cheap so-called "Medical Batteries" which are popularly advertised?

They are usually inferior induction coil batteries with scarcely any true medical properties for therapeutic use.

Are not almost all cheap popular batteries sold to the laity one type of crude induction coil battery?

Yes. They are all faradic batteries.

What type of battery is represented in "electric belts"?

Electric belts are usually a series of miniature simple cells encased in a belt, and when wet with an exciting solution generate a miniature galvanic current.

Does the fact that a current can be "felt," or can be made to give "shocks," or can set up contractions of muscles, make it a therapeutic current?

No.

What defines a "therapeutic" current of medical electricity?

Qualities of action by means of which the competent physician can establish actions in diseased tissues which demonstrate definite therapeutic effects.

Are the actions of true therapeutic currents set up in the tissues automatically without regard to the method of administration?

No. More depends upon proper administration than in the case of drug remedies.

ELECTRO-THERAPEUTIC PRESCRIBING.

Why is this so?

Because different drug actions are obtained by prescribing different drugs in one of a few chief ways, but the great variety of electro-therapeutic effects arise from alterations in the quality and dosage of each current which are controlled by the skill of the prescriber.

If Drs. A, B, C and D prescribe mercury in the same form and dose will it have the same effect in each case?

No. The state of the individual patient will modify the effect in any one case.

But in a general way would we expect a similarity of action in all physicians' hands?

Yes. We expect mercury to serve one physician as well as another.

Is the same principle true also of electricity?

Yes, in theory.

Does it carry out the principle in practice?

Only when the same currents, dosage and methods are employed with the same skill.

Would it be practical to obtain nearly uniform results from electricity in the hands of different physicians in different localities?

As much so as in the prescribing of drugs.

What would be needed to bring this about?

Nothing except adequate and uniform instruction.

If each physician then was equally well taught in the subject of electro-therapeutics the clinical results would be as reliable and uniform as is now the case with drug therapeutics ?

They should be more reliable and uniform because local actions are under so much more exact control.

Does the special knowledge and skill of a surgeon, or neurologist, or expert in any other branch of practice, qualify him to prescribe electricity or to act as consultant in a question of electro-therapeutics ?

Not until he also studies the subject of electro-therapeutics.

Does the purchase of an expensive battery qualify the purchaser to use it with proper skill in the treatment of disease ?

Not until he also studies the essentials of electro-therapeutics.

Is there any exception to the rule that a physician must study dosage, actions and technique in order to use electricity as medicine ?

No.

To obtain a rational comprehension of scientific electro-therapeutics how should the principles of prescribing electric currents be studied ?

The physician should study the prescribing of current actions and apply to them the same medical principles that guide him in prescribing drug actions.

Is it a mistake then to teach a list of "methods" for use in certain diseases ?

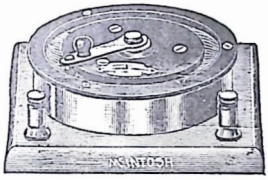
It leaves the student in the dark as to the real treatment of the case.

Suppose you are informed that a certain disease should be treated by "Longitudinal galvanization," or by "Diagonal galvanization," what sort of prescribing would you consider this?

It would appear to be on a par with ordering certain diseases treated by "Tinctures," or by "Pills," without regard to the needed therapeutic action of the pills or tinctures.

Is it not then simpler and more rational to observe the indications of the given diagnosis and adopt the general medical principle of prescribing the therapeutic actions that will best meet the indications?

Yes.



Cautery Rheostat.

Does the fact that these actions are to be produced by electricity or any other remedy change the principles of prescribing?

Not in the least.

Then the physician who has already been taught the general principles of medical therapeutics has only to learn the medical actions of electric currents and how to produce them to

be able to prescribe electricity as accurately as he does drugs?

Yes.

Does this simplify the matter of prescribing electricity?

Yes. It substitutes precision for vague methods, and applies scientific principles instead of tabulating an endless list of mechanical methods.

In the use of electricity as well as in the use of drugs cannot similar actions be set up by more than one method of treatment?

Yes. In the great majority of cases.

Is not this another important reason why prescribing electricity in the popular routine way by mere names of "methods" is less scientific than to exactly state the "action" required to combat the morbid state?

Yes.

What proper bearing on treatment has the fact that similar actions can often be set up by more than one method?

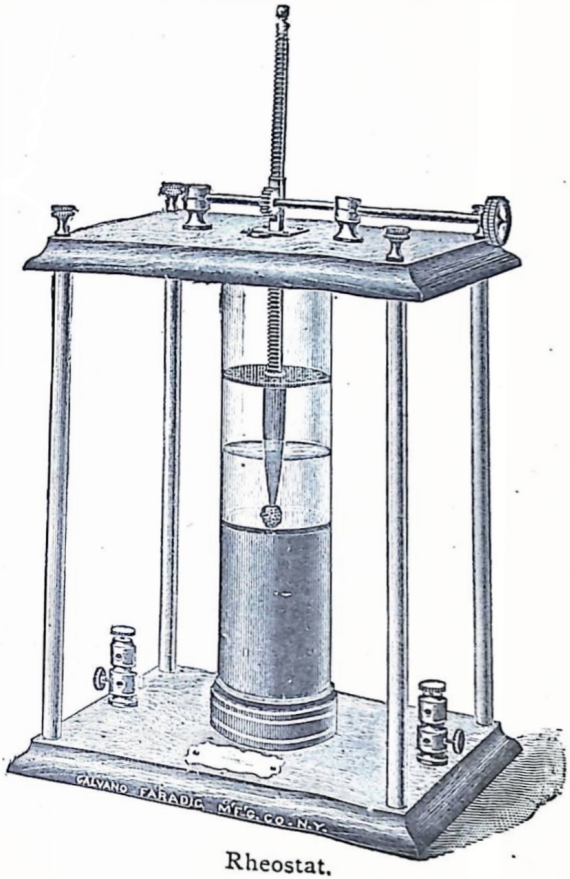
The physician who precribes the indicated therapeutic action has a choice of means to produce it, and can often operate to better advantage than if restricted to a single method.

What particular study would you make to qualify you to understand the effect that can be produced by each and every method of using any electric current?

I would study the "physiological actions" of each current.

Are these very fully and accurately determined?

Yes. By the great masters of physiological investigation.



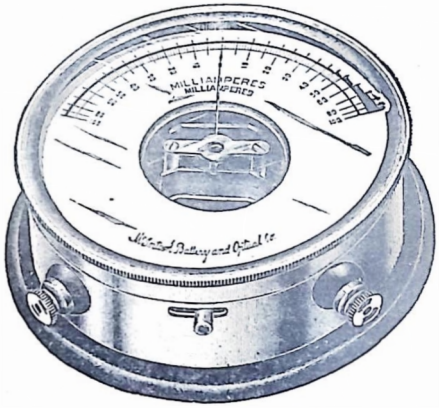
Rheostat.

Is any other study required?

Chiefly the additional instruction of clinical experience.

Before Medical Electricity can be applied to the treatment of patients what must be done with it?

It must be made available in the form of Currents which can be given desired therapeutic qualities, controlled at will, measured and dosed to meet diagnostic indications.



How do medical currents compare with what are generally called "street currents"?

Much as medicinal iron compares with a sledge-hammer, or as sulphate of quinine compares with the growing Peruvian tree.

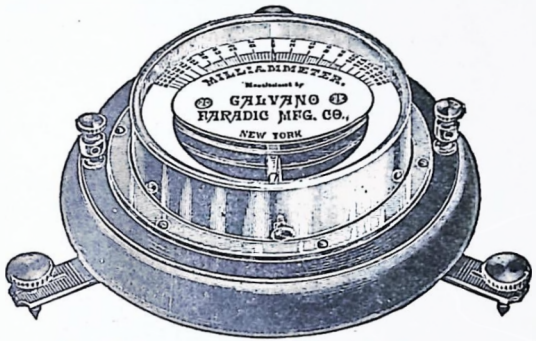
You mean that medical currents are exceed-

ingly small currents especially refined for medicinal uses ?

Yes.

A poisonous dose of strychnine may be only two or three times a proper medical dose ; how many times does the Edison street current exceed the medical unit of the constant galvanic current ?

Ten thousand times.



Can you state the different types of medical currents now in use ?

1. Galvanic.
2. Induction coil. (Faradic.)
3. Sinusoidal.
4. Static.

What other current can you name ?

The cautery currents employed in surgery.

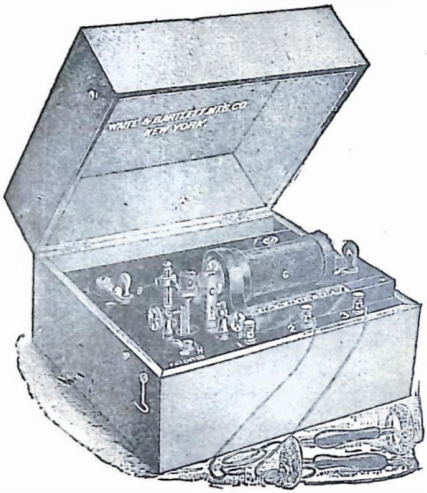
Can any two or more of these types of medical

currents be derived from the same battery or apparatus?

No.

Does each type of current require a separate and particular apparatus?

Yes.



Cannot a galvanic current be obtained from a faradic battery?

No.

Cannot you do cautery work with a faradic battery?

No.

Why can neither of the above things be done?

For the same reason that you cannot grind flour in a

steel rolling-mill; the machinery is not constructed for the double purpose. It is made for one use only.

Then in order to employ any given current you must possess the special kind of battery that is constructed to supply it?

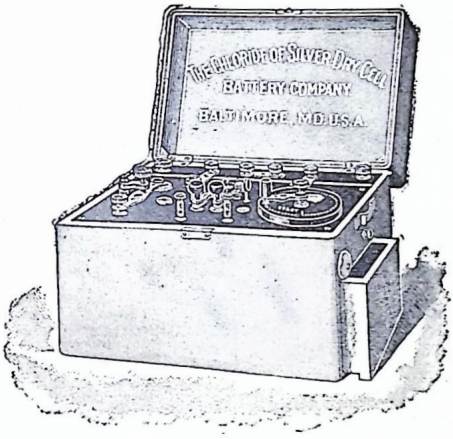
Yes.

Is there no exception to this rule?

None whatever.

Will you now state plainly and simply what is a medical galvanic current?

It is the direct product of chemical action in the cells



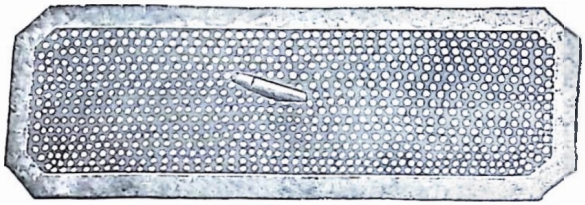
of the battery, and conveyed to the patient through direct conductors without passing through any mechanism which alters its character and quality. A deep stream of water in a placid river gives the idea of the

relative flow of the galvanic current as compared with others.

What is the Faradic current in brief?

It is the current from the same cells as the galvanic current (or a few of them), but before reaching the patient it is first passed through mechanism which alters its state and kind of activity. If the water from the placid river is carried over a precipice, the "water-fall" (with its reduced supply of stream but great increase of force) suggests the change that transforms the output of the cell into a Faradic instead of a Galvanic current. The "Induction coil" is the "transformer."

Is it essentially a constant current?



Felt Pad Electrode.

No. It is created by "interruptions" and cannot exist in a "constant" form.

Has "magnetism" any relation to medical electricity?

Only one. The iron core in the primary faradic coil is magnetized.

In what way?

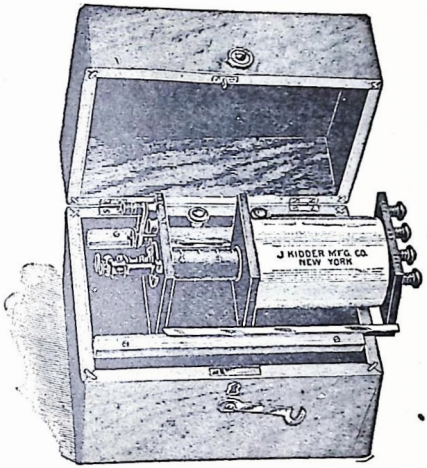
When a number of turns of copper wire are spirally wound around a few soft iron rods the rods become mag-

netized during the flow of a constant galvanic current through the windings of the wire.

Do the rods lose their magnetic state when the current stops?

Yes.

What is the effect of thus magnetizing the rods?



Their magnetic action "induces" an Electro-Motive-Force.

Where?

In the coils of wire over the rods.

In both primary and secondary coils?

Yes.

When?

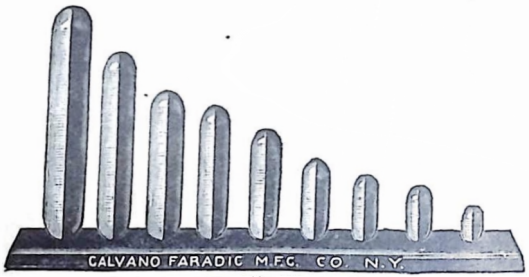
During the periodical activity of the primary cell current.

Does the amount of current "induced" in the coils depend on the amount of magnetism set up in the iron rods?

Yes.

How can this be increased and decreased at will?

By varying the amperage of the primary inducing current.



Tips for Metallic Electrolysis.

Does the magnetism of any current employed in medicine injure a patient's watch?

No.

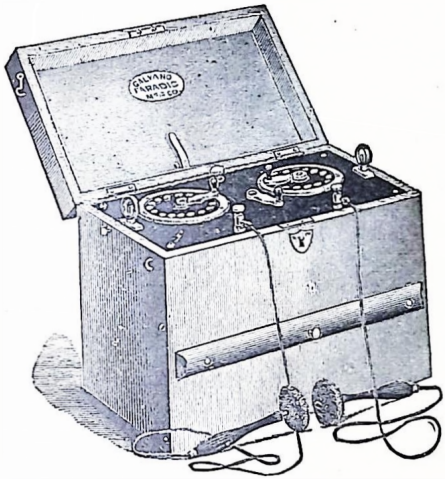
Does magnetism itself act directly on living tissue in any way?

Tests with the largest magnets tend to show that magnetism exerts no attracting influence on the human tissues, and it can be ignored in practical therapeutics.

But the current induced in coils by the action of magnetism is used in therapeutics is it not?

Yes. It is the well known type of current called the "Faradic," or induction coil current which is varied in its medical qualities by mechanical alterations in the construction of the apparatus.

What is the character of the Sinusoidal current?



It may be considered practically as a modified Faradic current with certain refinements due to special construction of the type of apparatus.

Do all three of the above currents originate in nearly the same way?

Yes, but as heat which originates in a fire may be

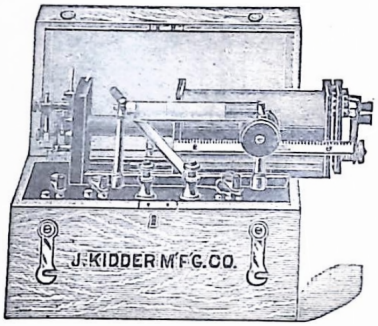
made to do many different kinds of work by means of different utensils, so different appliances make electricity from a common source do many different kinds of work.

Does Static electricity originate in the same way?

No.

What do you mean by "Static electricity"?

It is a form of electric current which may be said to compare with the water flow in the water-works of our



Faradic Battery.

cities. When you turn the faucet it flows with force at a rapid rate, but in so small a quantity that to use it you generally let it run and accumulate in a basin, tub, or whatever may be required for the given purpose.

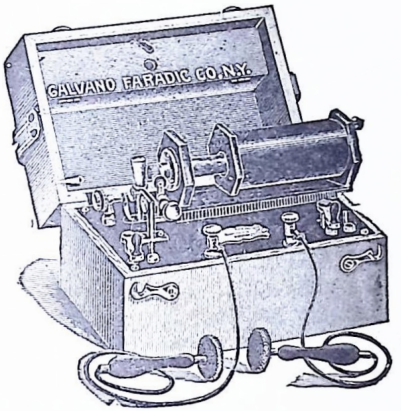
How do we obtain Static electricity?

From the modern Static machine which has been developed from the first frictional type of the last century into an induction type of greatly improved efficiency.

What is the Static machine?

The therapeutic apparatus is briefly a large machine combining stationary and revolving glass plates with a series of brass collectors enclosed in a tight case from the side of which extend out two prime conductors to which attachments are made during treatment. The student need not perplex himself with further details of construction as a better idea can be had later on seeing the apparatus in use.

In developing electricity into an exact science



it has been necessary to select a few arbitrary terms to permit measurements and other records to be made, just as it was long ago found necessary in weights and measures to coin the words pound, foot, acre, mile, quart, bushel, etc. What

are the three chief terms of electrical measurements?

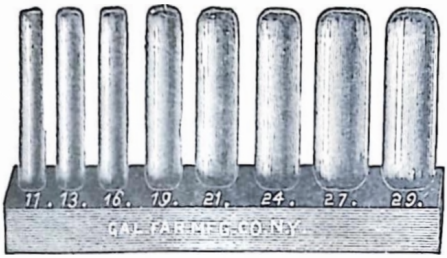
Ohm, Volt, and Ampere.

Are there others?

Yes, in commercial Light and Power records there are a number of terms that do not enter into medical consideration at all.

Explain the term Ohm.

In 1827 Dr. G. S. Ohm propounded the law on which



Long Tips for Metallic Electrolysis.

all possible electrical development has since rested. In his honor the name Ohm was selected to indicate the Unit of electrical resistance.

What is the exact unit agreed on as the standard of resistance?

It is equal to the resistance of 1000 feet of pure copper wire, size 10, at a temperature of 75 degrees F. It is about as small an amount as a grain is in avoirdupois weight. It is important for the student to get the comparative idea in mind but it is a pure convention and is never measured by physicians. It is sufficient to realize that one Ohm is a very small resistance, so that when reading of circuit resistance in terms of Ohms

you will approximate the total in a mental picture of the state.

What is meant by the word Volt?

In 1800 Volta was sharing with Galvani in the world's esteem the honor of discovering the primary current from which the modern era of electricity dates. His name was selected to indicate the Unit of pressure which forces the current to flow. It is called the unit of electro-

Short Tips for Metallic Electrolysis.

motive-force, or E. M. F. The number of "Volts" expresses the mechanical side of a current.

What is an Ampere?

In 1822 the eminent French philosopher and mathematician, Ampere, published his brilliant "Observations on Electro-Dynamics." To honor his name it was selected to indicate the Unit of that element of a galvanic current which is variously called "strength", "volume," "quantity," "rate of flow." A full Ampere is small for a trolley car but is much too large for medical currents, so it is divided into one thousand parts and the unit in medical measurement is one miliampere.

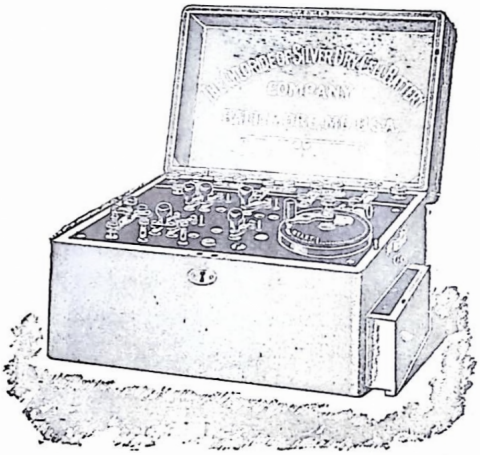
These three terms then express the three central factors in medical electricity?

Yes. The physician must become as familiar with these units, the Volt, the Ohm, and the Miliampere, as he is with the dosage of drugs.

Does he actually measure them in treating patients ?

Only when using the constant galvanic current, as no instruments are yet made which serve the same purpose with other medical currents, but the mental conception of these units must be so clear as to guide the treatment without actual measurement. The skilled carpenter does much accurate work by " rule o' thumb " without square and compass.

Does the rule that "the rate of current flow is



equal to the pressure divided by the resistance" apply to all currents ?

Yes.

Does it apply to Static electricity ?

Yes.

Does it apply to the electro-cautery?

Yes. The rule is universal.

Does a practical battery for medical work require a means of measuring the resistances of patients?

No. Not in practice.

Does a medical battery require a voltmeter?

Eye Electrodes.

Primary cell batteries do not, but certain methods of reducing street currents down to medical proportions require a voltmeter.

Is a miliammeter necessary for the physician?

With one current it is indispensable.

What current is this?

The constant galvanic.

Is a meter used with the interrupted galvanic current?

No.

Why not?

Because an electric current only deflects the needle while it is flowing, and the needle drops back to zero when the flow is interrupted, hence it does not register the dosage.

Are there any other meters of any kind adapted to medical batteries?

No.

ELECTRO-PHYSICS.

Into what three great branches of study is Medical electricity divided ?

1. Electro-physics.
2. Electro-physiology.
3. Electro-therapeutics.

What is the subject of Electro-physics ?

So far as the practicing physician is concerned it may be regarded simply as the knowledge of how to keep in order and operate his electrical batteries.

What is the difference between the theory and practice of Electro-physics ?

A physician can master the practical "physics" of such apparatus as he buys in a very short time; theoretical treatises covering the entire subject could tax the student for days without end.

Is it necessary for the student to learn out of a text book how a battery is constructed ?

No. Construction should be shown the student with the battery in front of him.

ELECTRO-PHYSIOLOGY.

What is the second great branch of study in Medical electricity ?

Electro-physiology.

What is Electro-physiology ?

So far as it concerns the physician it is the study of

the actions that can be set up upon (and within) living tissues by means of each and every medical current, by any and all methods of administration, all degrees of dosage, and under all conditions of resistance or conduction.

Is this an important branch of study?

It is as important as the similar study of drug actions and as indispensable to the physician.

Must a physician be familiar with electro-physiology in order to prescribe medical electricity in a proper manner?

Yes. To use electric currents with ignorance of their actions would be as culpable as to prescribe belladonna, aloes, ipecac, colchicum, etc., before studying their actions and dosage.

Douche Electrode.

Are the physiological actions of all electric currents now very fully known and demonstrated?

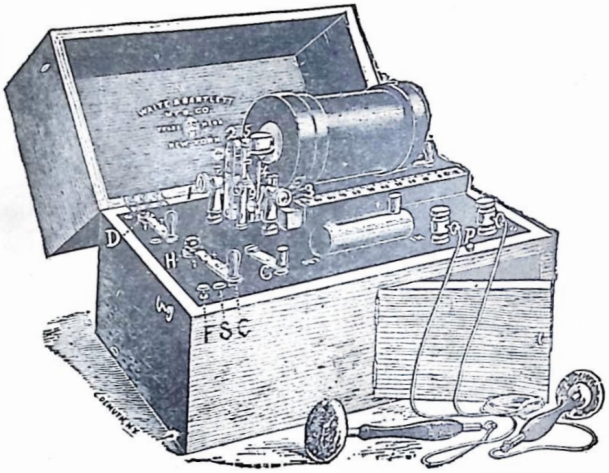
Yes. Few drugs are so well known.

In general how are electric currents applied so as to set up their actions in the tissues?

By means of "electrodes" which are placed on (or sometimes within) the tissues which it is desired to affect.

What is an electrode?

Literally an "electr *way*." A device for conducting the current to and into the tissues with the kind of contact that is best suited to the case in hand.



Must an electrode be made out of a good "conductor"?

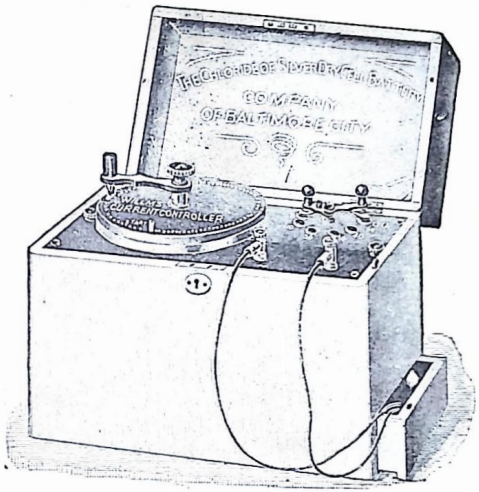
Yes.

What conducting substances are usually employed for electrodes?

The various metals, and water.

But we read of sponge, felt, wash-leather, flannel, clay, and other electrodes?

These substances are not the electrodes but simply coverings for certain necessities of contact. They are non-conductors.



If this is the case how can they be employed?

It is necessary to saturate them with a conducting fluid before they can constitute an "electric way" into the tissues.

Are they then conductors?

No. The conductor is the fluid held in their meshes.

Must the entire electrode be made of conducting material?

No. They are all made with an insulating handle for the operator to hold.

Why is such a handle necessary?

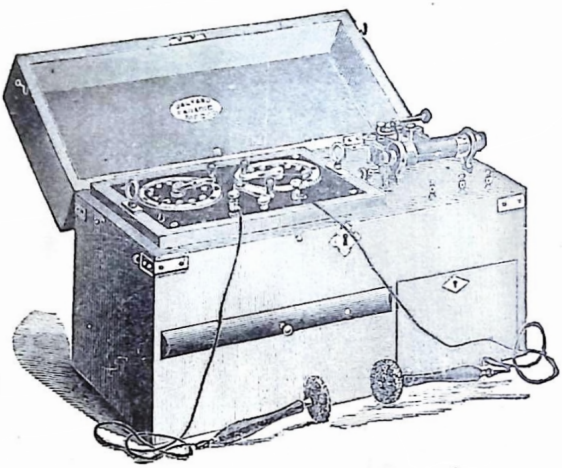
Both for convenience and to direct all the current to the patient instead of diverting it in part to the physician who holds the electrode.

What is the insulating handle made of?

Wood, soft rubber, or hard rubber, or occasionally of glass.

What regulates the size and shape of electrodes?

Adaptability to the size and nature of the parts to which any special electrode is to be applied.



Are many electrodes required for medical use?

Just as each department of surgery requires certain special tools, and the tools for the eye will not do for the pelvis, so in the uses of different currents the treat-

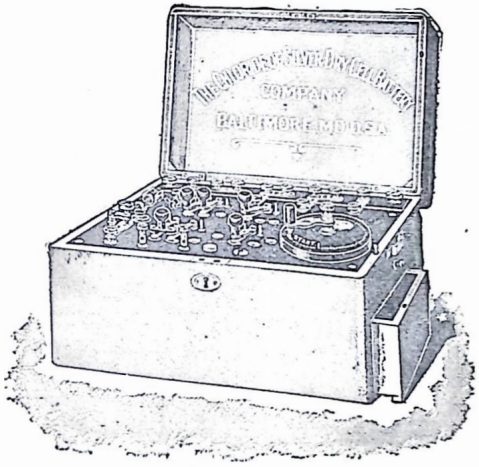
ment of different parts of the body calls for a variety and number of electrodes that increases as practice grows.

What is the total number of electrodes now made for all currents inclusive?

About three hundred.

Does any one physician require all of these?

No.



What is it that makes an electric current sometimes burn?

Resistance.

How does this cause a current to burn?

The friction of resistance developes heat energy out of the expenditure of electrical energy.

Can you give a common illustration of the same principle?

Yes. If the closed hand is rapidly run down a coarse rope the friction will cause heat.

What is the extreme illustration of the principle in electricity?

The electric light and the electric cautery.

What causes the heat in the electric cautery?

The resistance of the platinum electrode, which is a poorer conductor than the heavy copper wire of the rest of the circuit.

But how does this principle bear on the use of ordinary electrodes when it is not intended to "burn" a patient?

The resistance of too dry an electrode, or the resistance of the skin when it is not properly reduced by the operator, may cause a minor burn that is not intentional.

Should this accident be avoided?

Always.

Is the principle of avoiding burns in electrotherapeutics simply one of equalizing resistance in the circuit?

Yes.

With what current is an accidental effect of heat set up by improper resistance?

The constant galvanic current.

Is it the principle source of danger in placing this current in ignorant hands?

Yes.

Is this "danger" easily avoided by ordinary skill?

So easily that no good operator ever "burns" a patient at all.

What carries the current from the battery to the electrode that is applied to the patient?

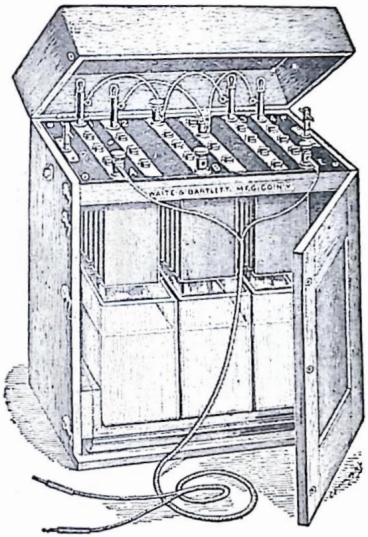
A conducting cord.

Has it any other name?

It is sometimes called a "Rheophore."

What are "conducting cords"?

Simply a few twisted strands of fine copper wire protected with an insulating cover and tipped with exposed



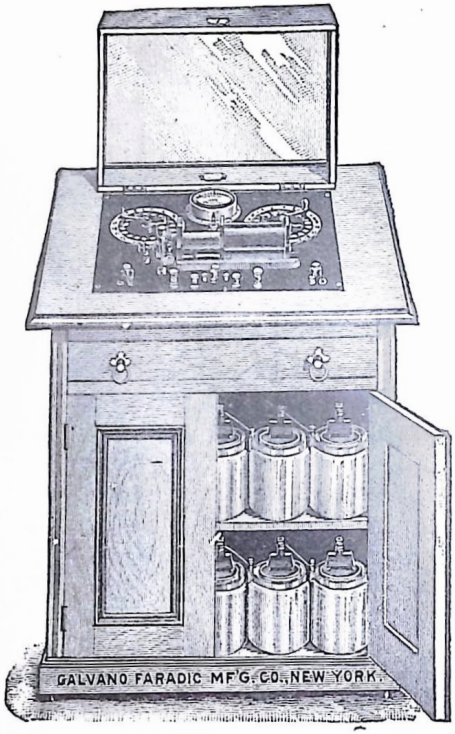
metal points that fit into the electrode handle and the battery post.

How long are the cords?

They may be any length to suit the needs of the user.

They must reach from the battery to the patient with ease and in general practice it is well to have several pairs of assorted lengths of three, five, and seven feet.

What are the main uses of "bare metal" electrodes?



With the galvanic current they are used chiefly on moist surfaces of mucous membranes with so little re-

sistance that there is no burning. They are also used in electrolytic work. With interrupted currents of small heating capacity they may be used with impunity when they are convenient. All Static electrodes are bare.

What then is the chief requisite of an electrode?

Adaptability to the purpose of treatment. It must be so constructed and shaped that it will aid in producing the desired action of the current.

Does any part of the action of the current depend on the electrode?

Yes. In certain forms of galvanic work all the special action depends on the electrode; in other cases the results are divided between the intrinsic action of the current and the manner of employing the electrode.

Is the management of the electrode ever a matter of indifference in skilled electro-therapeutics?

No. The artist in technique displays his chief skill in the manipulation of electrodes.

GALVANIC CURRENTS.

In the study of physiological actions of electric currents we then must take into account more than the mere undirected influence of a given current?

Yes. Many of these actions cannot be demonstrated without certain skill.

What is the chemical difference between the two galvanic poles?

The positive attracts acids from the fluids of the tissues in contact with it, while the negative pole attracts alkalies.

What is the mechanical difference between them?

The negative pole will excite the greatest contraction in normal muscles.

What is the calorific difference between them?

The patient feels the greatest sense of heat at the positive pole when both contacts are alike.

How can you most briefly state the positive polar action when covered electrodes are used with the constant galvanic current?

It is sedative to irritable nerves, tonic to nerve and muscle fibre, anti-congestive, osmotic, pushes fluids towards negative electrode, has a restful and refreshing effect on fatigued states. Excessive dosage sets up heat and pain beneath the electrode and will finally vesicate the skin.

Under the same conditions what is the action of the negative pole?

It increases irritability of nerve and muscle fibres, relaxes tissues, attracts fluids from the opposite pole.

Will either pole contract muscles?

Yes. Contractions are usually set up by "interrupting" the current, and when this is done the negative pole produces the strongest contractions with a given amount of current.

What can you state to be the general interpolar action of the constant galvanic current?

It is a complex influence varying with the dosage

and the state of the tissues but in general is nutritional, electro-tonic, sedative, anodyne, alterative, warming, refreshing, vitalizing, and strengthening. Electrolytic action is modified and special effects depend on the relation of the electrodes, condition of the tissues, current-strength, and duration of flow.

What do you mean by "inter-polar" action?

The influences exerted on tissues between the electrodes but beyond the region of the local action at the site of contact of the electrodes.

In electro-therapeutics is the interpolar action of all currents as important as the direct polar action?

It is seldom so important. It depends on the method of treatment and the object of treatment.

What is the local polar action at the positive pole when bare metal electrodes are used with the constant galvanic current?

It depends greatly on the particular metal of the electrode.

Why does it depend on the kind of metal used as the conductor?

Because the positive galvanic current attacks certain metals and re-forms nascent new salts of the metal and deposits them along the tissues with an altered medicinal action.

What are the most important of these therapeutic metals?

Copper, zinc, silver, mercury, and iron.

When any one of these metals is employed what is the method called?

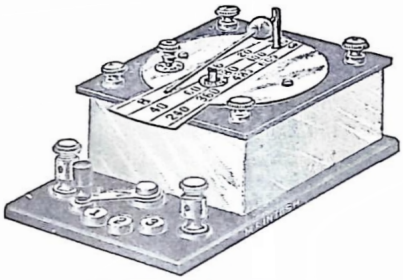
Metallic Electrolysis.

That is the general term. What is the special term for a special metal?

It takes the name of the metal, as Cupric electrolysis, Zinc electrolysis, etc.

Upon what tissues are these "soluble" metallic electrodes chiefly employed?

Upon mucous membranes which are the seat of catarrhal inflammations.



Galvanic Interrupter.

Does the medicinal action in part resemble the ordinary applications of salts of these same metals, as, sulphate of copper, nitrate of silver, etc.?

Yes. But as the new-formed salts are carried by the push of the current into the tissues below the surface the actions of metallic electrolysis are deeper than the simple topical methods.

Is their action also aided by the accompanying current?

Yes.

Do the actions of metallic electrolysis cause any destruction of tissue?

No. Not with medium dosage.

How would you summarize these actions with medium dosage?

They are antiseptic, germicidal, anti-hemorrhagic, drying, astringent, (styptic in larger doses), tonic, nutritional, and alterative, according to the pathology attacked and the metal and dosage used.

When was this method introduced in medicine?

In 1893.

Is it an important contribution to therapeutics?

Yes. Within its narrow limitations.

Is it a method that requires frequent repetition?

No. It is usual to repeat it only at intervals of several days. In cases that require it, Metallic electrolysis is rapidly curative and onl, a few applications are made.

Is the application agreeable?

In the Uterus where it is most employed the patient does not feel it at all. Near the great sensitive nerve of the face, on the conjunctiva, and the naso-pharyngeal lining, a sufficient dosage excites pain and a local anaesthetic is first applied.

What are the new salts of metals that form from the pure metal that is "dissolved" by the galvanic electrolysis?

The positive pole collects acids from the fluids of the moist tissues and in combining with the particles of metal that are released "Oxy-chlorides" are gradually

developed in proportion to the intensity and duration of current action.

What is a marked peculiarity of action which occurs during the chemical evolution in the tissues ?

The tissues in contact with the electrodes become adherent to it.

Does this occur in any other application of medical electricity ?

No.

Should the electrode be released by force ?

No. It is always released by gentle chemical action to avoid traumatism.

What is the chemical action that is most easily employed ?

The alkaline and softening action of the negative pole.

How is this applied ?

The current is reduced to zero and the polarity reversed and a small dose of negative electrolysis then allowed to act for a moment.

What are the means usually employed to demonstrate the actions of metallic electrolysis before attempting to treat patients ?

The actions can be fairly tested by plunging the metallic electrodes or needles, into a hard boiled egg, and also into a piece of lean beef.

In what respect do such tests fall far short of illustrating the therapeutic actions of the method ?

The circulating blood and functionation of living

tissues carries the action deeper and farther than egg and meat tests demonstrate.

What special preparation of the electrode is required in applying Metallic electrolysis?

The metal bulb, or needle, must always be freshly and completely cleaned and brightened.

How is this commonly done?

By rubbing the surface with the finest emery cloth.

Does the electrode then need any antiseptic precautions?

No. The method itself is asceptic and antiseptic.

What one essential must be observed?

Clean and absolute contact of the electrode with the tissues treated.

Will the method be ineffective if contact is imperfect?

Yes. Many of the disappointments in the use of this and other electro-therapeutic methods arise from neglect of essential conditions.

Can the adhesion of the electrode to the tissues be prevented when in certain cases this is desirable?

Yes. Easily, by simply keeping the electrode in very slow movement instead of holding it still during treatment.

Why cannot this method be employed on the external surface of the body?

The rapid collection of acids and the chemical action would be absent. The skin does not provide the essential conditions of low resistance, and moist tissue, through which the complex fluids of the body are within ready reach of the current.

What would occur if an uninformed operator attempted this method on the skin?

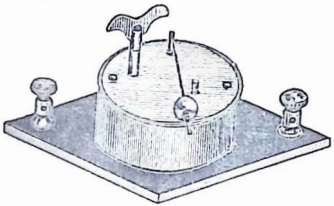
A burn would result followed by an ulcer.

Is a galvanic ulcer very slow to heal?

Yes.

What treatment would you prescribe for such an ulcer?

Healing nutritive processes can be quickened by local applications of high-frequency currents and by the positive static spray.



Galvanic Interrupter.

Is the rule of slow healing also true of a galvanic burn and ulcer on a mucous membrane?

No. Such an ulcer rarely occurs, but when it does it heals quickly.

What treatment is usually applied?

None. The tissues are let alone till healed.

If these same electrodes are next used with the negative pole of the constant galvanic current will the effect be similar?

No.

Will there be any attack on the metal of the electrode?

None whatever.

How will the action of the current expend itself?

Entirely on the tissues, as a negative electrolysis.

Are these actions applicable to the external parts of the body?

Not on the surface of the skin but puncture through the skin makes the method available.

What are the conditions required for treatment by the actions of "negative-electrolysis?"

The same as stated for positive electrolysis. Low resistance and moist tissues with circulating fluids.

With the negative pole then can any metal be used in an electrode?

Yes.

Are there any metals that can be used with the positive pole without being affected by the current?

Yes. Gold, platinum, aluminum, and pure tin are available when the positive polar action is desired without attacking the electrode.

Will all of these metals carry equally large currents without being affected?

No. Gold and platinum will carry any medical current, but are too expensive for general use. Pure tin will carry all dosage required for moderate electrolysis and its low cost makes it useful for many purposes.

What are the actions set up in relation to the negative electrode within moist tissues?

With the constant galvanic current a mild dosage increases capillary circulation and nerve and muscle irritability. There is a mild osmosis; an electrolysis which is alterative, relaxing, dilating, nutritional, and

healing. It increases the local blood supply and by thus promoting the processes of physiological function many morbid states are improved in ways that are difficult to explain.

Is the activity and degree of these complex influences of the current affected by the dosage?

Yes. With medium doses the action becomes more intensely congesting, softening, osmotic, and electrolytic.

What do "strong" currents accomplish at the negative pole?

They intensify the processes from softening into liquifying; from congesting into hemorrhagic; from electrolytic osmosis to caustic and escharotic action.

Will still higher dosage cauterize tissues, and cause destruction to follow?

Yes. Intense electrolysis at either pole causes final destruction of tissue.

In what respect do these polar destructive processes differ?

Somewhat as acid escharotics differ from alkali escharotics.

What kind of scar tissue succeeds destruction at the positive pole?

A white hard contracting cicatrix.

What is the character of the negative cicatrix?

It is a soft pink scar.

In what kind of treatment do these scars occur?

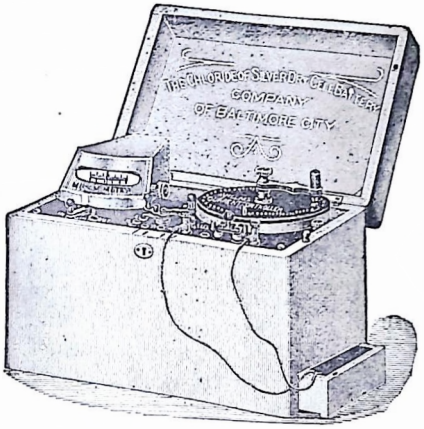
In surgical electrolysis for the reduction or removal of tumors.

Do they call for consideration in the ordinary medical uses of galvanic currents?

Very rarely.

In electro-gynecology you will read of galvano-cauterizing applications to the lining of the uterus; is this the actual cautery current?

No. The cautery battery current is used as an elec-



tric knife which cuts and sears. The galvanic term signifies simply an intense and rapid electrolysis of high degree.

How do the purposes of the two methods differ?

The surgical cautery aims to remove or destroy diseased tissue; the medical "galvano-cauterization" aims at alterative and nutritional repair.

How are the three distinctive groups of galvanic current actions classified in terms?

They are classed under the heads of cataphoresis, electrolysis and catalysis. From these three arises a fourth action which is called electrotonus.

What is "electrotonus"?

It is a tonic state of nerve and muscle fibres induced by the passage of the current through them.

Do the two poles produce the same character of electrotonus?

No.

How do they differ?

The state produced by the positive pole is one of "lessened irritability," while at the negative pole the irritability is increased.

What is meant by the general term Electrolysis?

It is osmosis with an electric polar action repelling or attracting the fluids. The positive pole repels while the negative attracts, hence there is an influence upon the circulation between the two electrodes.

If the positive pole lessened the capillary fullness would it be "sedative" in congested conditions and their accompanying pains?

Yes.

In cases of local anaemia would the fluid-attracting property of the negative pole be likely to set up nourishing, stimulating, derivative and alterative actions with benefit to the patient?

Yes.

Is this galvanic property of affecting fluid flow

utilized directly, apart from electrical treatment ?

Yes.

How ?

It is employed to " push " into the tissues any soluble drug to secure its concentrated local action ?

What is the difference between doing this and using a hypodermic needle ?

There are several differences. One is rapid, the other slow; one freely pours the remedy into the tissues for systemic as well as local effects; the other is not only local but for the most part a superficial application.

In what cases in practice does cataphoresis displace the hypodermic ?

Principally in a limited class of minor surgical anaesthesias.

In what year was morphine cataphoresis demonstrated ?

In 1859, by Dr. B. W. Richardson.

Is cocaine now chiefly used for cataphoric anaesthesia ?

Yes.

Does the administration of a drug remedy f. medicinal purposes by cataphoresis alter or add to the medical properties of the drug ?

No more so than its administration by an injection.

In what respect does cataphoric medication hamper electro-therapeutics ?

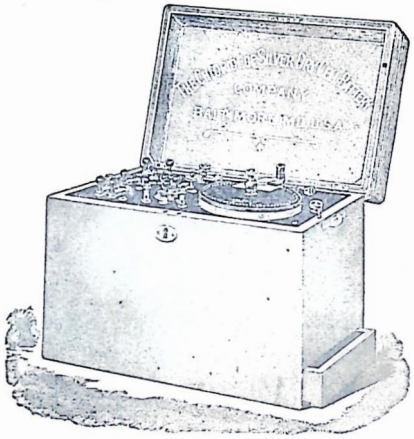
Cataphoresis is possible with but one current, and requires a special " stabile application " with a restricted dosage.

Are definite clinical results obtainable by using drugs in this way?

Yes.

Are they impossible to obtain in any other way?

No.



Can other direct resources of electro-therapeutics generally accomplish the same or better results?

Yes.

But the method has a certain value?

Yes.

What two drugs represent special value by this method?

Iodine and cocaine.

Is the treatment of rheumatic arthritis by cataphoric medication recommended?

Yes.

Are the results better than are secured by action of the current alone?

They are better than are secured by the galvanic current alone and this is the only current that can be employed in cataphoresis.

But are the results better than can be secured by other currents without cataphoresis?

No. .They are decidedly inferior.

What is the significance of the term "catalysis" as applied to galvanic current action?

It was suggested by the celebrated Remak forty-five years ago to express the complex remainder of interpolar galvanic action after accounting for cataphoresis and electrolysis.

What was Remak's statement of the actions which he called "catalytic"?

They are those properties of the galvanic current in general which supplement cataphoresis and electrolysis by dilating the blood vessels and lymphatics, stimulating glandular secretion and increasing the powers of absorption and osmosis in the negative region, and doing the reverse in the positive region. The term also includes the galvanic influence upon molecular exchange and nutrition due to exciting or soothing the nerves themselves or the parts which they supply; also the changes in the molecular arrangement of protoplasmic structures and in their nutritive activity produced at the same time; and finally, the consequences of the me-

chanical transference of fluids and salts from the positive towards the negative pole.

Is the old term Catalysis accepted now as a scientific term?

No. Modern research has separated galvanic actions into more exact constituents, but the word will be met so often in electrical writings that the student should be familiar with the idea behind it.

Will the constant galvanic current contract both striated and non-striated muscle fibres?

Yes.

On what will the degree of contraction depend?

On the polarity, the dosage, and both the state of the tissues and the technique of using the electrode.

Will a stabile application of the positive pole on the vertex or back of the hand produce a sense of contraction and pressure?

Yes, with a small current.

Would the same dosage and application on the thigh contract the muscles?

No.

Will a labile application set up contractions with a smaller dose of the constant current than is required with a stabile application?

Yes.

Do both poles act alike in this respect?

Not intrinsically, but an expert in dosage and technique can demonstrate similar medium contractions with either pole by using more current with the positive pole.

Does the rate of change of the electrode affect the degree of contraction?

Yes. A dose that will scarcely stir the muscle when

the electrode is moved slowly will cause the same muscle to jump vigorously when the electrode is given a quick labile sweep over the surface.

But how are the most efficient contractions induced with the galvanic current?

By interrupting it.

How is this done?

By one of three methods.

State them.

1. By an interrupting handle to the electrode.
2. By an automatic interrupter on the battery.
3. By breaking the circuit with one cord tip held in the hand.

Is the interrupted galvanic current particularly efficient as a muscle contractor?

Yes.

Can it be made to cover the entire field of therapeutic needs for this purpose?

By no means. It has very definite limitations.

Do not some writers state that "it is superior to all other currents" and that "it affords the best muscular contractions"?

Yes.

Do such writers state the facts?

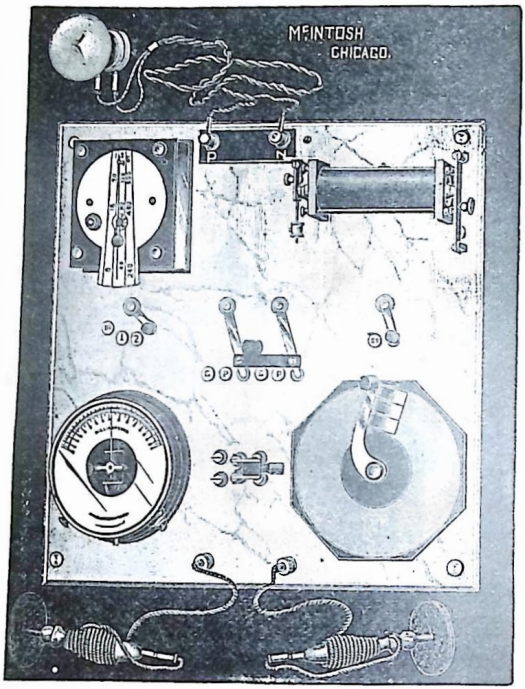
No.

How can you explain the many conflicting statements in print on this point?

By the obvious lack of trained experience with all types of modern scientific electro-therapeutic apparatus on the part of many authors of the past.

Can sound judgment be developed by the man of one apparatus?

It is not easily done. The great conflict between Duchenne and Remak, who were the real fathers of scientific electro-therapeutics, arose from the fact that



Switchboard (McIntosh.)

each championed one apparatus. Remak did everything he could with the galvanic current while Duchenne put the faradic to every possible test. This is a wrong view

of medical electricity which is made up of the sum of all currents supplementing each other.

Can medical dosage be regulated exactly with all uses of the galvanic current?

Yes.

Is the miliammeter the "dose regulator" of this current?

No. It indicates the amperage of current flow, but that alone is not the dose.

What are all the factors that enter into scientific dosage with the constant galvanic current?

1. Surface area and type of electrode, its material, etc.
2. Situation of both poles during treatment.
3. Tissues treated and their pathological state.
4. Quality and degree of therapeutic action indicated.
5. Time and frequency of administration.
6. Reading of the meter as a guide to developing the dose which the judgment of the operator prescribes to meet the indications.

Then two physicians using the same number of miliamperes on two different patients would not be using the same dose unless all the other factors also coincided?

No.

What is the real basis of dosage?

The density of the current and not its total quantity.

What do you mean by the "density" of the current?

The concentration or diffusion of a given number of miliamperes over a smaller or larger surface. Intensity of action is proportioned to density.

Then if you spread a little current over a large electrode you will not have much in one place ?

That is the idea.

While if you condense what appears to be a small total current into a very small electrode the actual dose at contact may be larger than a large current applied with a large electrode ?

Yes.

Is there great variety in the size of galvanic electrodes ?

Yes. They range from fine needles to tips, olives, bulbs and sounds, and from small hand electrodes to pads that will cover the entire spine or abdomen at once, and from an ounce or two of water for the insertion of a finger joint up to a tub full for the treatment of the entire body.

How has this great variety of utensils been developed ?

By devising instruments to meet the needs of special cases.

Are they all necessary ?

Not for the beginner, but in a growing practice the needs grow as experience developes.

In the application of electrodes what are the two terms that are commonly used to indicate whether the instrument is held still in one place or moved about ?

Stabile and labile.

In a stabile application the electrode is stationary during the treatment ?

Yes.

Does the knowledge of this fact define the action of the current or the method of treatment?

It simply indicates that the electrode was held still.

Then such a phrase as "stabile galvanization" would not explain how the case was treated?

No.

Does the term "labile galvanization" convey any definite idea of treatment?

No.

Why not?

Because certain factors of technique control the effects of either stabile or labile applications and these must be known in order to comprehend the exact treatment

What are these factors?

Pressure upon the electrode, resistance at the contact, and rate of change of the current.

Do you mean to say that if two physicians make a labile application upon an arm with the same current, same dose by the meter, same electrodes, and same method, but with a difference in the pressure of the electrode on the tissues that the therapeutic actions set up will not be the same?

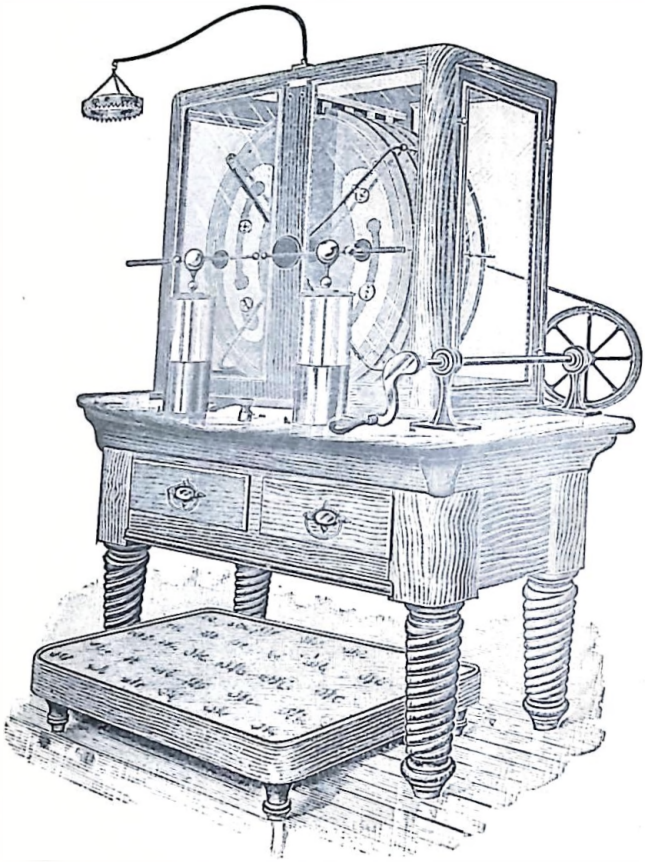
They will not be the same, and where one might succeed with his case the other might fail utterly.

Why does "pressure" affect results so greatly?

Because the whole science of electricity is centred in the question of contacts. Without proper contact conduction is a lottery instead of an exact science. Pressure controls contact.

In practical therapeutics are there grades to "pressure" to be governed by the action desired?

Yes.



Static Machine (McIntosh.)

How can the physician familiarize himself with these grades of pressure?

By tests on his own tissues, noting the effects and comparing them.

In referring to "rate of change" what may be meant?

1. The rate of increase or decrease of current-strength.
2. The rate of interruption when an interrupted current is employed.
3. The rate of labile movement given to the electrode.

Do all these rates bear directly on the quality and degree of theraputic action?

Yes. They are vital to the results.

Does this statement apply to all electric currents or only to the galvanic?

It applies to the whole range of medical electricity.

Then the physiological actions of all electric currents are the product of much more than dynamics, and electrics, and the formula of the mathematician?

Yes. They are as much dependent on skill in the operator as is the piano on the technique and skill of the musician. Neither a piano nor a battery has the inherent volition to fulfill its own functions unaided.

Without attempting elaborate detail can you state the main scope of galvanic technique?

1. The current can be either constant or interrupted.
2. The active electrode may be either positive or negative.
3. Treatment may be local or general.
4. Either polar or inter-polar properties may be made to predominate.

5. Covered, or bare metal, electrodes of different sizes shapes and material may be employed, labile, or stabile.

6. Medication by either cataphoric methods or metallic electrolysis may be added to current action upon mucous membranes and within soft tissues and all soluble remedies may be driven into or through the skin.

7. Each local or general effect of the galvanic current may be increased or diminished by regulation of the current density and the duration of the sitting.

Is it the rule in electro-therapeutics that local morbid states call for local applications of electricity, while general diseases call for general applications?

If the rule is interpreted with medical experience and judgment it may be adopted in practice.

Cite an instance illustrating the principle.

Eczema, a local expression of systemic perversion of function, is curable, not by local galvanic action, but by the systemic improvement of general methods.

What is the one great general method of employing the galvanic current for systemic effects?

It is called Central galvanization.

What gives it this name?

The term implies that the tonic, alterative, function-regulating, and nutritional, actions of the current are directed to the centres of the entire cerebro-spinal nervous system.

How is this done?

By contact of the negative pole over the region of the solar plexus while the positive electrode is in turn made to direct the current through the cerebral and spinal

centres from the vertex to the sacrum, and including the anterior distribution of the frontal region of the head.

In this treatment is a variety of dosage and technical manipulation of the electrode required to produce its maximum effects ?

Yes. Skill and experience can accomplish more with central galvanization than the method can accomplish in the hands of the novice.

What can you say about the indications for galvanic currents in disease ?

Some time or other in the course of almost any chronic disease and in some acute diseases a patient may present local or general conditions which can be improved by selected actions of this type of medical electricity. A long list of names of diseases is given in standard text-books, but the student should not memorize names. He should learn to apply principles of prescribing. He who knows what a remedy will do and how to make it do it has only to meet the indication to at once prescribe properly. Pathological types are few; names of diseases are many and perplexing.

Will the galvanic current combat congestion ?

Yes.

Will it also allay inflammation ?

Small dosage and the positive polar action will efficiently treat certain local inflammations, metallic electrolysis is effective in certain catarrhal inflammations of mucous membranes, the negative polar electrolysis is of great service in removing the effects of local inflammations and absorbing exudates, and other after-effects yield to the interrupted galvanic current.

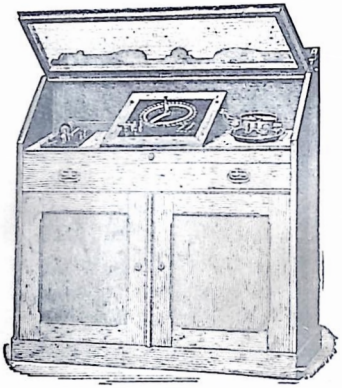
Is the constant galvanic current especially

indicated in nervous irritability, neurasthenia, in deranged nerve functionation, and in profound depression of the central nervous system?

In these conditions it is invaluable.

What especially indicates this current in the treatment of paralysis?

The loss of response to other currents.



Galvanic Cabinet.

Do you mean that you would use the interrupted galvanic current if the faradic current or any other failed to make the muscles contract?

Yes.

Would you use it in paralysis under any other conditions?

Yes. When it caused better and more efficient con-

tractions than any other current, even though all reaction was not lost.

Is the constant galvanic current a wonderful reliever of pain?

Yes.

What kinds of pain will it best remove?

Those which are caused by conditions in the tissues which the current is able to reach and combat.

What can be said about the permanency of the relief afforded?

If the cause is removable by the current action the effect is a radical cure. If the pain is the expression of an incurable pathology it nevertheless can be abated and often kept under satisfactory control even though it returns. In many other cases the relief lasts an indefinite time of days, weeks, or even months, and in scarcely any case is the action of any drug so lasting.

How does the quality of relief from pain compare with the relief of anodyne drugs?

In kind and degree there is no comparison in the great field of chronic disease. Anodyne drugs tend to depress tissue resistance to pain, affect the heart or digestion, or in some way have by-effects that are a drawback to their palliative actions. On the contrary, when an electric current relieves pain (and electricity will control more pains than morphine), it increases tissue tonicity, improves nutrition, depresses nothing, has no reaction, does not narcotize or stupefy to disguise sensation, but imparts a natural and refreshing sense of return to the normal state.

In case of weak heart has electricity any of the danger of the coal tar analgesics?

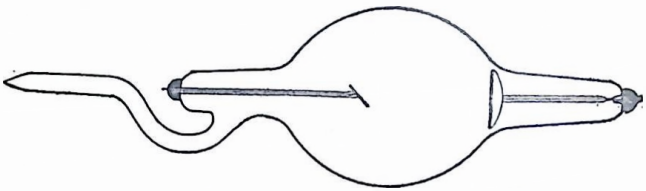
No. On the contrary it is tonic in its action on the heart if it is used for this purpose by a skilled physician.

Are there any electric currents that will injure the heart?

Any and every electric current can be so violently abused intentionally (or through ignorance) that it annoys the heart and any other tissue it attacks. This is abuse and not use. Skilled use makes electricity one of our chief remedies in both functional and organic heart diseases.

The terms Anelectrotonus and Catelectrotonus are frequently met with in electro-physiology. What do they mean?

A current enters and leaves a nerve. Faraday, the universal investigator, called the "way in" the Anode (positive pole) and called the "way out" the Cathode (negative pole). On the way in the current lessens the



"Monell" type of X-Ray Tube (McIntosh.)

irritability of the nerve and on the way out increases it, while about midway the state of the nerve is unchanged. The three sections of the nerve between the two electrodes are therefore in three states of irritability; catelectrotonus at the out-going current, anelectrotonus at

the in-going current, and in a state of "negative variation" in the middle section.

Do the many pages of text books that have been filled with these researches help the student how to treat his patients with electric currents?

No. The scientific physiologist revels in hundreds of laboratory experiments and beautiful demonstrations with electricity that the therapeutist can, alas, do nothing with.

What is "Pfluger's law of reaction" to the constant galvanic current?

1. Weak currents, ascending or descending, cause contraction only when the contact of closing the circuit is made.

2. Closure of an ascending current causes stronger contraction than the closure of a descending current.

3. The irritability of a motor nerve increases from periphery to centre.

4. Moderate currents cause contraction on both making and breaking the circuit with either direction of current, the closing contraction being the stronger.

5. Very strong currents produce contraction on breaking the ascending current and on making the descending current.

What is the use of this formula to the physician?

It is considered the basis of electro-diagnosis.

ELECTRO-DIAGNOSIS.

What is "electro-diagnosis?"

It is the examination of the electrical reactions of diseased nerves and muscles, and a comparison of the results with the reactions of normal nerves and muscles.

What is in chief expected from such an examination?

It will show "qualitative" and "quantitative" changes from normal electrical reactions.

What bearing has this on diagnosis?

It may determine whether a state of disease exists, whether it has a central cause or is peripheral (important in paralysis) and detects degenerative changes. It baffles the malingerer, and diagnoses chiefly by exclusion.

Is electro-diagnosis a subject for much consideration by the undergraduate student?

No. It is a subject to work out later in the clinic. It is beyond the needs of the junior student.

Whom does it chiefly interest?

Neurologists.

Does electro-diagnosis lead to an actual diagnosis of disease as a physical examination of the chest enables us to diagnose bronchitis, or asthma, pleurisy, tuberculosis, etc.?

Diagnosis in this sense is not possible by any electrical tests of nerves and muscle fibres.

Is the subject of electro-diagnosis usually much confused in the physician's mind?

Yes. Physicians generally expect in it more than the

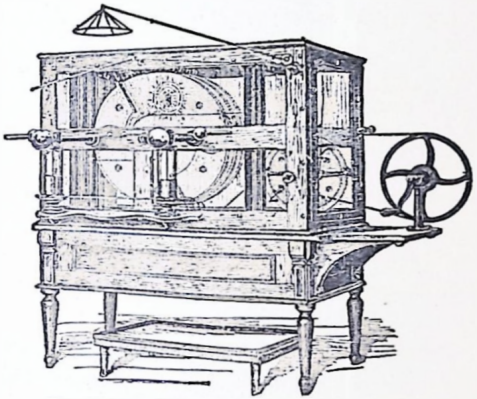
subject contains. The term suggests too wide a scope, while its real meaning is very little.

Is there any essential relation between the "reaction of degeneration" and the prognosis of paralysis ?

No.

Does our demonstrating the "reaction of degeneration" determine the etiology of disease ?

No.



Static Machine (Waite & Bartlett.)

What may be said of RD in diagnosis ?

When groups of muscles exhibit RD the lesion is usually in the anterior cornua of the spinal cord ; RD locates the seat of the lesion ; it separates in a broad way certain diseases of spinal origin from diseases of

cerebral origin; it excludes hysteria and malingering; but does not name the disease or state its cause.

May muscles exhibit RD and yet recover?

Yes.

May RD be absent in grave cerebral and spinal lesions?

Yes.

So much is said in electrical and physiological writings about Reaction of Degeneration (abbreviated RD), can you state more fully what the term covers?

RD in any given case may be partial or complete, early or late, but when complete it reveals itself by such alterations of normal reaction as the following:

1. Neither current will contract the muscles tested.

2. The faradic current will not contract the muscles but the galvanic will.

3. A small galvanic current causes as strong a contraction as would require a much larger dose of current if the muscles were normal.

4. The muscles react to the positive pole as normal muscles react to the negative.

5. The quality of contraction is changed. The quick jump which should occur is tardy, sluggish, and has a slow rise and fall of less degree than normal.

Does this list refer to what is found at one time in all cases?

No. It states the steps from total late RD when all reaction is lost to all currents down to the lesser stages when over activity precedes loss.

Is there always a change in the "quality" of the contraction?

Yes.

In late RD is the contraction always slow and gradual instead of the elastic jerk of health?

Yes. This quality of contraction is pathognomic.

In early or partial RD is there always some alteration in nerve reaction to the faradic current?

Yes.

It is said that the earliest evidence of RD is discovered by the Static spark.

All currents will detect equally early evidence, the only requisite being equal skill in using them on the part of the physician, and this is rare.

What two currents are mainly used for testing reactions?

The two in most general use. Most physicians who have any apparatus at all have both galvanic and faradic currents, hence these are most used.

Does it require some practice to make these tests so that they mean anything diagnostic?

Yes. A novice cannot do it and know what he is doing.

Is it worth while?

Yes. If on test, normal contractions occur it proves that no RD exists. If RD exists on test it is known that it follows injury or disease of the nuclei of origin for the cranial nerves, or of the ganglion-cells of the anterior horns of the cord, or of the motor nerve-trunks. The tests disclose the state of the lower motor segment in a way that can be equalled by no other means of examination and if RD is found it at once excludes:

1. Malingering.

2. Hysterical paralysis.
3. The brain and the white matter of the cord.
4. Idiopathic muscular atrophy.

These exclusions clear the ground for the consideration of other lesions of the cerebro-spinal axis.

Has there ever been another phase of electro-diagnosis?

Yes. Diseases were to be classified on the basis that "health was a state of electrical equilibrium while disease was a loss of balance of this equilibrium." A cure was to result from "restoring the balance." Our regular division of diseases into Acute and Chronic was changed into considering Acute as positive diseases, or states of over-activity; while Chronic diseases were deemed negative diseases or states of under-activity. Thus "disease had a polarity." The positive pole would cure one group, the negative pole the other!

Is there any scientific ground for this theory?

It grew out of the scientific researches of the great physiologists but was perverted by early quacks who were not physicians and who fostered the idea because of its simplicity.

When did this form of electro-diagnosis flourish?

For about thirty years prior to 1875 it was taught by a school of itinerant "electricians" who did much writing and lecturing on the subject as they traveled from town to town treating "classes." Some of these men were very skilled in the use of such apparatus as they then had.

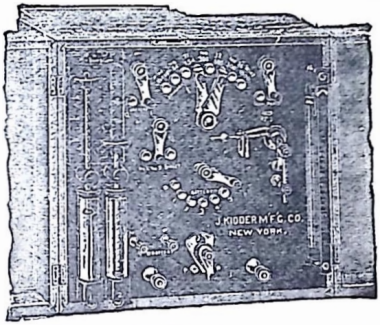
Did they also teach that electricity was

"Life", or the "Nervous fluid", "Vital force", etc.?

Yes. Quacks do the same now and advertise much that is unjust to a very noble therapeutic agent.

Has any modern writer revived the idea of the polarity of disease?

Yes. The theories of Wells published in 1869 (second



The "Monell" High Tension Induction Coil Apparatus.

edition) and advocated by him "for thirty years" were elaborated on a pseudo-scientific basis in recent years but attracted no attention. Indications for treatment have a much broader scope to them than so limited a theory can support.

GALVANIC EQUIPMENT.

What constitute the essentials of a complete galvanic battery for therapeutic uses?

A primary battery for complete galvanic therapeutics must consist of:

1. Cells connected in series, with terminal wires carried to the:

2. Switchboard, which must consist of a base on which are the current-controlling devices.

What are these parts of a complete switchboard?

1. A cell selecting switch.
2. A pole changer switch.
3. Posts for the conducting cord attachments.
4. A rheostat for the even increase and decrease of dosage.
5. A reliable meter to measure amperage of the constant current.
6. An automatic interrupter which can be adjusted to all needed rates.

Are all of these indispensable?

Yes.

How many cells are usually required?

For general office work fifty cells are the average employed.

What is a cell?

A simple primary cell is a glass jar two-thirds full of chemical "exciting" fluid in which are immersed a plate or cylinder of carbon (the negative element) and

a rod of zinc (the positive element). The zinc is coated with mercury to secure uniform action on its surface.

What are the chief varieties of cells used in medical batteries?

Large Leclanche type cells are used in galvanic cabinets. Small bichromate (red acid) and Chloride of Silver dry cells are used in portable galvanic batteries, and either fluid or "dry" cells can supply a faradic battery.

What is the difference?

Leclanche cells last two or more years without refilling, acid cells run down in a few weeks, dry cells will work for three or six months on the broken circuit work of the faradic current.

What do you mean by "polarize"?

When chemical activity between the fluid and the elements of the cell has "run down," the opposite poles have no further "difference of potential," and are "polarized."

Is the cell useless then?

Yes. The glass jar and the carbon remain good, but the fluid and usually the zinc rod must be replaced with new, and then the cell will be as active as before.

What is a "Rheostat"?

It is a device which places concentrated resistance in the path of the current before it reaches the patient, and by gradually reducing the resistance the dosage is controlled at will. A rheostat is often called a "current controller."

May it be connected so as to act on the current in just the opposite way?

Yes. It may first let all the current through it in short-circuit, and the dose is then raised by increasing

the resistance in the rheostat so that part of the current is gradually backed up into the patient by the resistance.

What is this method of using the same device called?

A "shunt" current controller. "Shunt" side-path versus "direct" path.

What is the modern miliamperemeter of the galvanic battery?

It is the original galvanometer devised by Oersted in 1820 but made so that the needle will require a standard amount of current to deflect it a certain distance. It is then "calibrated" or marked with a standard scale. The old galvanometer had no scale and simply showed that a current was passing. The scaled meter shows how much current is passing.

Are all meters reliable?

No. It requires a finely made instrument to register the current accurately.

Are all these accessory parts of a galvanic apparatus made alike by all manufacturers?

No. Almost every maker has his special model.

How then is the student to know which is best?

Neither this small compend nor larger text-books can properly deal with this question as each year witnesses some change or development. The latest information on questions of apparatus must always be sought from the manufacturers. Reliable dealers can supply the latest improvements at all times.

FARADIC EQUIPMENT.

What are the essential parts of a complete faradic induction coil battery?

1. Four or six primary cells with larger elements than the galvanic battery usually has, as the coil is more affected by amperage than by voltage.

2. A primary coil with a set of therapeutic secondary coils suitable for all the medical uses of the faradic current.

3. Two interrupters, rapid and slow, which can both be adjusted to needed rates.

4. Pole changer.

5. Switch for cutting in cells one at a time.

6. Current controller in the primary cell circuit.

7. Current controller in the secondary coil circuit.

8. Switches and cord attachments to complete the switchboard equipment.

What is the vital part of a faradic battery?

The "rapid interrupter," as upon its smooth and even action much of the current quality depends.

Is the factor of "quality" as important as the factor of "voltage" in medical coil currents?

Therapeutic properties and current-quality are made up of the factors:

(1) Voltage, (2) volume, (3) resistance, (4) rate of interruption, (5) quality of even, smooth, and clean regularity in the interruptions throughout the treatment. Defective action of the vibrator will nulify all other good points of the best battery made.

What is required to supply this efficient quality of interruption except proper construction, proper care and cleaning, and proper regulation ?

Nothing.

What rates of interruption are employed with the slow vibrator ?

They are to be adapted to desired rates of muscular contractions, and therefore range between one and five periods per second.

What is the range of the rapid faradic interrupter ?

From 10,000 to 30,000 per minute.

How can the correct rate and quality of action be regulated ?

By turning the set screw of the platinum tip of the device.

What is the guide to correctness ?

The trained ear of the operator and his practical experience.

Why are common faradic batteries devoid of therapeutic currents ?

Because the E. M. F. is deficient, the coils lacking, and the interrupting devices too coarse to supply the character of action which is essential. As well ask why a cheap pendulum clock is not capable of acting as a ship's chronometer. Its mechanism lacks adaptation to the purpose.

But do not many physicians use cheap faradic batteries and think well of them ?

A hand printing press was "thought well of" years ago, and so was a hand sewing machine. They seem

less wonderful in the presence of a steam power Hoe press and the modern sewing machine with its attachments. The ships of Columbus were "thought well of" by him but the passenger on the modern Cunarder thinks differently and with reason. The idea fits the case of cheap batteries of all types.

Is the faradic an alternating or intermittent current?

It is not a true alternating current.

How is the induced current set up in faradic coils?

An "induction" current of electricity is established in a closed wire circuit placed near to but not in contact with another circuit through which a current is passing.

What is the course of the current from cell to patient in a faradic treatment?

The primary cell current passes along a conducting wire to and through the coil of copper wire wound spirally around the bundle of iron rods which is the core and central factor in induction. The current sets up magnetic action in this core which attracts and repels the head of the spring type of interrupter. Another wire conducts one pole of the cell current directly to the interrupter to make the circuit. The law of "like poles repel and opposite poles attract each other" establishes the series of "makes" and "breaks" which permit and interrupt action around the coil. While the current flows round the inside coil near to but not in contact with the outer secondary coil we have the conditions which set up an induced current. This secondary current from the therapeutic coil is then conducted by wires to the terminal posts and then to the patient.

Does the first coil current possess therapeutic properties?

To a very limited extent and range of application. It lacks E. M. F. and flexibility of dosage.

Why is a set of secondary coils essential for the treatment of various conditions?

Because one coil alone does not provide the entire range of therapeutic dose.

Have the "long" and "short" coils different actions?

No. Not different actions but different degrees of action.

Why are they part of our means of dose regulation?

The E. M. F. and amperage of any coil-current depend on the inducing current and the length and cross-section of the wire of the secondary coil and the number of times it is wound around the field of the primary current. The longer the wire the more turns it can be wound, and the finer the wire the less the bulk of the coil and the volume of the current.

Why does increasing the length of the coil cut down the volume?

Because it increases the resistance. (See Ohm's law).

Must the entire length of any secondary coil be over the primary coil in order to present the full value of the induction process?

Yes. Only that part of the coil that is acted on by the primary current induces a secondary current.

Does this make any difference in treatment?

Yes. It is one means of reducing or increasing the dose.

FARADIC CURRENTS.

Can all parts of a battery and all factors in current-quality be submitted to practical test by the physician so that he can know exactly what the apparatus is doing?

Yes. No part of any apparatus or any action of any current is left to chance by the skilled operator. Accurate tests are the basis of all scientific electro-therapeutics and without them there is chaos.

What is the difference between the poles in coil currents?

There is a difference but not the chemical difference that exists in the galvanic current. The push of the coil current drives from the positive to the negative as is well shown by the Geissler tube test described by the present author in his larger text-book, and at the negative pole the greatest contraction of muscles is set up.

With dose modification as to size of electrodes and current-strength can nearly similar results be demonstrated with both poles?

Yes. Nevertheless the choice of poles is not negligible in practical therapeutics. .

What is the rule to guide the physician in using coil currents?

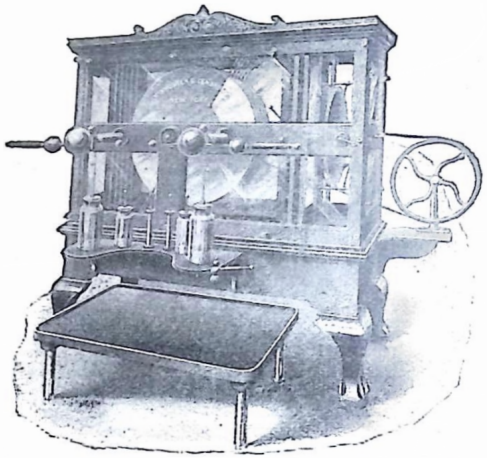
Fix clearly in mind what it is desired to accomplish and select the coil, the rate of interruption, the electrodes, the dosage and the particular technique with this end in view,

How can the student ascertain what coil currents will do in the treatment of disease ?

By the same study of demonstrated physiological actions as must precede the use of every current and of every other therapeutic agent.

What may be considered the physiological range of most of the popular faradic batteries in former use ?

Coarse currents from coarse batteries mainly set up gross nerve and muscle stimulation or contraction.



Static Machine (Van Houten & Ten Broeck.)

Does the fine scientific induction coil apparatus go far beyond this ?

Yes, as much so as the microscope does work beyond the cheap " magnifying " glass.

State as briefly as possible the main actions of efficient coil currents on living tissues?

These actions are so complex that a summary is inadequate. The sum of the stated actions do not result from the mere current in automatic use, but are the product of many variations of method and dosage requiring a finely adjusted battery and skilled technique. To one who does not know what various methods and qualities of current are required for these actions they appear too complex and too contradictory to be credited to one form of remedy, but they are easily demonstrated by all experts.

So long as the older and cheaper batteries remained mere crude mechanical affairs without any semblance of scientific refinement, the Faradic current was used almost wholly to cause muscle stimulation. It was not fit for much else. But as finer workmanship has developed coils, interrupters and current controllers into a high state of efficiency, the therapeutic range of the resulting currents has been correspondingly increased. Nearly the whole influence of faradic currents within the tissues results from their contracting effect on contractile fibres of all kinds and the quality and degree of contraction set up.

By appropriate dose regulation and correct technique, coil currents can be made to stimulate or soothe; can be made to produce intermittent muscular contractions or degrees of tetanus; can be made to allay or cause pain; can combat congestion and local inflammation; can reduce œdema and soft hyperplasia by promoting absorption, increase wasted or non-developed muscular structures by improving the local blood supply and the func-

tion of contraction; can be made to tranquilize the nervous and circulatory systems; can be directed to the improvement of both local and general nutrition, the relief of many symptoms of diseases that require other measures for the pathology, and lend much other aid that cannot be stated in words. Coil currents are the mechanical cousins of the chemical galvanic current, and the student may perhaps get a broad general view of their medical scope if he considers them as a means of quickly concentrating the actions and securing the therapeutic results that may otherwise be more slowly developed by skilled combinations of exercise and massage. Coil currents go beyond passive and active exercises and massage, and will do some things that nothing but electricity will enable the physician to accomplish.

Does the faradic current attack the metal of electrodes?

No.

Does its administration require the precautions that are needed in using the galvanic current?

No. It will not set up electrolytic action, or burn and ulcerate, or cauterize.

Does its higher voltage carry it more readily into all tissues so that the patient's resistance needs no special reduction as is the case with galvanic applications?

Yes.

Are fewer and simpler electrodes required for faradic work than for galvanic administrations?

Yes.

What are the factors that enter into scientific faradic dosage in the treatment of patients?

1. Character of the current, relation of the E. M. F. to amperage.
2. Selection of electrodes.
3. Situation of electrodes and their manipulation during treatment.
4. Rate of current interruption.
5. Current-strength.
6. Tissues treated, conditions, etc.
7. Time and frequency of application.

In the manipulation of faradic electrodes what are the two most important considerations?

"Pressure" and "Rate of change."

Is the "strength" of the faradic current measurable by any meter or other instrument?

No.

What guides the physician to an accurate adjustment of the current-strength?

The trained judgment of experience.

Can you cite a familiar example of accurate measurement by "judgment" under conditions that baffle instruments?

Yes. Stand a merchant two hundred feet in front of a home plate. He knows nothing of the science of fielding. A ball is coming towards him in the air but he cannot measure its rate of change, its exact direction or locate the spot where it will light. If he tries to catch the ball he may dart in a dozen directions and at last miss the ball by a dozen feet. No yard-stick or meter would help him and he has never learned how, to "judge" a ball. But put in the field a professional

League ball-player. He will not make a false step. So accurately will he judge the direction and rate of change of the flying ball that when it lights his hand will be under it within a sixteenth of an inch of the exact centre of destined contact. His measurement of the place the ball will land and the time it will get there is infallible. A similarity of judgment developes in the practiced operator of a coil battery. He becomes able to gauge his current-strength with definite exactness to suit a given case.

SINUSOIDAL CURRENTS.

What is in brief the so-called Sinusoidal apparatus and its type of current?

It is essentially a modified induction apparatus and current, or "refined edition" of the faradic.

What is one of the differences?

The primary exciting current is not broken by sharp and total interruption, but rises and falls by swelling and sinuous waves. The "sine" character of this rise and fall of exciting current gives its name to the apparatus.

Is it an alternating current?

Yes, but may be made unidirectional by a commutator.

How does its voltage compare with faradic coils?

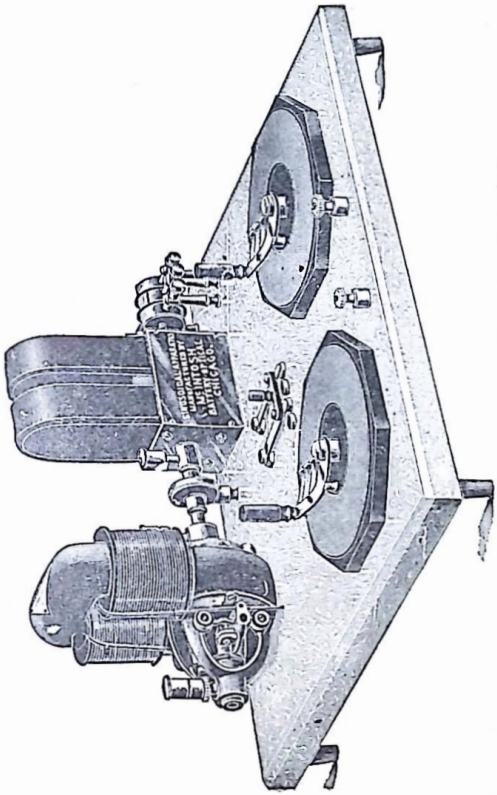
It has a lower voltage than most coils.

How does it compare in amperage?

The range of a proper apparatus provides doses that cover nearly all the therapeutic coils.

In what does the advantage of this apparatus lie?

While it parallels many of the actions of a scientific faradic battery, it also has refinements and varying qualities of its own which make it another string to our bow in the sum total of electro-therapeutics.



Improved Sinusoidal Apparatus (McIntosh.)

It is then an important addition to other batteries?

Yes. No one who has such a machine would willingly part with it.

How is the current employed in practice?

With the same electrodes and by the same technique employed with the finest faradic currents.

Do the physiological actions parallel those of other efficient inductions coils?

Yes. But there are certain higher grades of action which may be briefly summarized as follows, according to the statement of Apostoli:

"Clinical tests upon more than a hundred patients show that these currents exert in the majority of cases a most powerful and generally beneficial action upon diseases which are due to lessened nutrition by accelerating organic changes and metabolism. This is proved by analysis of the urine of which the following is a brief resume:

"The quantity becomes more normal; the products of waste are better eliminated. The increase of combustion is shown by the diminution of uric acid, while the percentage of urea is generally increased. The elimination of the inorganic products is also changed, but in a manner less marked.

"When daily seances are given, each lasting fifteen minutes, we may generally observe in patients submitted to the influence of these currents the following modifications in their general condition.

Return of sleep.

Increase of strength and vital energy.

Improved mental state, power for work and ability to walk.

Improvement of appetite, digestion, etc.

General progressive improvement. This general nutritional improvement often manifests itself after the first seance before any local influence is apparent and before any change has occurred in the urinary secretions.

"Local pain and trophic changes are often more slowly affected by these currents until they are applied locally instead of by a general seance.

"The diseases which seem to derive most benefit from the general alterative action of this current passed through the entire body to affect the general nutrition are rheumatism, gout and diabetes."

The current from the latest improved Sinusoidal machine is efficient for the relief of many pains, exerts a most powerful grasp on muscle fibres, and taking into account all rates of interruption from slow to very rapid and all methods of application, it covers a great range of therapeutics.

STATIC ELECTRICITY.

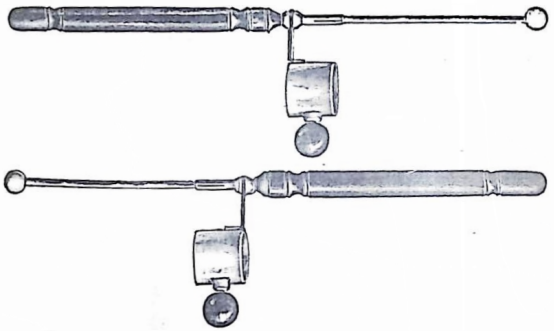
What are the chief physiological actions of Static electricity?

The actions of this form of medical electricity do not all result from any one method of use or from the unskilled application of any methods. They differ according to conditions of dosage, quality of current, resistance in the circuit, technique and skill of the demonstrator, state of the tissues, etc. They are not to be regarded

as the actions of a single drug are studied, but rather as the combined actions of a number of therapeutic agents tested separately but reported all together. Without this explanation of the flexibility of this great current which can be administered in so many ways the range of its utility cannot be understood by the student.

The following is taken from the chapter on this subject in the author's larger treatise, "The Treatment of Disease by Electric Currents."

The physiological effects of static electricity are chiefly modifications of the ordinary vital processes without



Pair of "Monell" Interrupters for X-Ray work with Static Machine.

electrolytic alterations. Static electricity may increase, diminish, arrest, or otherwise modify these functional processes. It affects secretion, excretion, absorption, reflex action, sleep, respiration, circulation and nutrition. Owing to its enormous E. M. F. and its power of condensation and accumulation, it possesses great dif-

fusiveness, which enables it to affect the entire system in a limited degree.

That static electricity had a decided influence upon the physiological functions is not a discovery of our own times, but was observed before galvanism and faradism were dreamed of. In a work written previous to 1790 we read the following remarks on this subject:

"Electricity, strongly communicated to insulated animal bodies, quickens their pulse and promotes their perspiration. If it is communicated to insulated fruits, fluids, and in general to every kind of bodies that are actually in a state of evaporation, it also increases that evaporation, and that in a greater or less degree according as those bodies are more or less subject to evaporate of themselves, or as the vessels that contain them are conductors or non-conductors and as they have a greater or less surface exposed to the open air."

In 1777 and 1781 there were published in London editions of a treatise on medical electricity, by Tiberius Cavallo, in which are recorded all that was known in his time of the subject in hand. Cavallo recites as follows:

"The remarks made by philosophers relating to the effects of (static) electricity upon the human body in general, are the following, viz., that by electrization, whether positive or negative, the pulse of a person is quickened, the number of pulsations being generally increased about one-sixth; and that glandular secretions and the insensible perspiration are promoted and often restored when they have been entirely obstructed. It might naturally be suspected that the promotion of perspiration and of glandular secretion was only the consequence of the accelerated pulse and not the immediate

effect of electricity; but the contrary is easily proved by observing that in various cases the quickening of the pulse by other means, as fear, exercise, etc., does not promote those secretions nearly so much, if at all, as electrization, and also the glandular secretions and perspiration are often promoted by electricity when applied only to a particular part of the body, in which case it seldom, if ever, accelerates the pulse. Hitherto it has not been discovered that (static) electricity acts within the human body by any chemical property, as most medicines generally do; but its action by which it produces the above-mentioned effects may be considered merely as a mechanical stimulation, for it seems to act as such even with those parts of the body which, especially when diseased, are mostly out of the reach of other remedies. . . . From these observations it appears that the application of (static) electricity does not merely promote any discharge or circulation of fluids, but rather assists the *vis vitæ*, or that *innate endeavor* by which nature tends to restore the sound state. It may, perhaps, be ever difficult to explain in what manner electricity assists that natural endeavor, but experience shows the certainty of the fact, and with it we must be gratefully content; for we may apply the effects to our wants, though we may be ignorant of their cause and mode of action.

"When an electric shock is sent through any part of the body, an instantaneous involuntary motion is occasioned, which shows that the muscular fibres through which the shock is sent are expanded or in some other manner convulsed. This involuntary motion is also occasioned by sparks. Farther, when a shock is sent through several

substances besides the human body, a tremulous motion and an expansion is evidently occasioned, as may be shown by many experiments. Now all these observations may perhaps in a manner explain the action of electricity upon the organized parts of an animal body by comparing it with the tremulous motion given to tubes of any sort through which fluids are transmitted, in order to accelerate their passage or prevent any stoppage or stagnation which might occur.

"In my essay upon Medical Electricity it is mentioned that from the experience of many it appeared that electrization increases the number of pulsations about one-sixth, but having made many experiments upon myself, I added the following observation in the second edition of my essay in the year 1781, and consequently long before Mr. Van Marum's experiments: 'I do not remember that my pulse was ever evidently accelerated by electrization, and yet I have tested the matter at various times and with great diversity of circumstances. In another essay I have stated that by repeated experiments, accurately made by Mr. Van Marum and other ingenious persons, it was found that electrization, whether positive or negative, did neither sensibly augment or diminish the natural pulse rate in a healthy man. Upon the whole, therefore, it seems to be ascertained that electrization does not increase or retard the ordinary number of pulsations, and the increase generally observed before may have been due to fear or apprehension. But I am now informed by Mr. Partington, who has long practiced medical electricity, that electrization, if not in a sound, at least in an unsound state of the body, augments the number of pulsations considerably."

About a hundred years later a French writer, Dr. A. Arthuis (1871), summed up the physiological effects of static electricity as follows:

"It induces an acceleration of the pulse, it is singularly *calmant*, eases the respiration, develops animal heat, augments cutaneous transpiration, makes more active the urinary secretion, disperses nervous irritation, and gives tone to the whole organism. It is the great dispenser of equilibrium to the disturbed balance of the system, it increases the vital forces, and augments the energy of absorption. In a word, it excites and facilitates the play of all the functions. It is regarded by those who use it as the greatest regulator of menstruation. The well-being which it instantaneously produces causes those who have once experienced it to wish for a repetition of its beneficent effects."

When, 140 years ago, it was discovered by the Abbé Menon that the human body loses weight by being continuously electrified for five or six hours, he attributed the loss to the increase of insensible perspiration and tissue change. We now say about the same thing in somewhat different language. The teachings of modern investigation upon this subject may be fairly stated in the following terms: "Static electricity increases the excretion of urea, and lessens the uric acid in the system by promoting oxidation. It increases both the appetite and the body weight when the latter has been reduced by impaired nutrition. It lowers the blood pressure. In ten to fifteen minutes of general electrification, or a few minutes of sparks to the spine, a gentle perspiration ensues, accompanied by a feeling of well-being. Under the influence of static electricity, the heart-beats undergo

a change, viz., if slow, they may increase ten to twenty beats per minute; or, if too fast, they may be reduced in number. It tends to regulate functionally deranged temperature. Many cases of neurotic, neurasthenic and melancholic conditions are found to have subnormal temperatures (97° to 97½°) before electrification. These states it adjusts to normal, and the patients then usually improve.

The static spark causes groups of muscles to jump. It is a most powerful stimulus to nerve and muscle function, and rapidly imparts tonicity, lightness, buoyancy and firmness to soft, lax and enfeebled muscular substance. It first causes a vasomotor constriction, blanching the skin. This soon gives place to a dilatation, and the spot gets red. Frequently a weal is raised, with a temporary sense of tingling and irritation, which will quickly pass away or be instantly removed by rubbing the part with a little toilet powder. If sparks are applied with sufficient persistence to the same area, a mild papular eruption will often be caused.

Devoid as it is of *electrolytic* action, the power of static electricity seems to be chiefly manifested as a regulator of *functions*. It tends to adjust to normal action the heart, respiration, pulse, temperature, oxidation, secretion, excretion, nervous irritability and sleep. It increases metabolism so that a person can absorb more oxygen: and this mere improvement in nutrition is a vast power for good, and alone tends to correct many morbid states; as gout, rheumatism, neurasthenia, neuralgia, anaemia and various symptomatic derangements.

The spark, by its powerful mechanical disturbance, sets up a great molecular change and acts as a stimulat-

ing massage. It thus affects the nutrition of a part, disperses exudation material, and promotes absorption. Thickenings of joints, tendons and muscles, localized œdemas, effusions, etc., are reduced by strong, thick static sparks. With fine, rapid frictional sparks may be obtained the beneficial effects of counter-irritation upon the skin; and with a special electrode a blister may be created in from one to four minutes, if desired. Sedative or stimulating effects are equally under the operator's control, and may be obtained at will. Many varieties of pain are promptly relieved by some form of static electricity; and, if not due to an incurable or persisting cause, it is well-nigh certain that the pain-killing property of this agent will give permanent relief, if treatment is persevered in long enough.*

Has the Static current greater voltage than other currents ?

It's voltage is enormously greater.

Upon what does the ability of an electric current to break down resistance chiefly depend ?

On its voltage.

If static electricity has greater E. M. F. than other medical currents, is it less obstructed by the resistance of the body ?

Yes.

Can it then be said to be more "penetrating" than the galvanic current ?

* Physicians will find very full directions for treatment in Dr. Monell's "Manual of Static Electricity in X-Ray and Therapeutic Uses," or "The Treatment of Disease by Electric Currents." The latter covers the field of all three currents, static, galvanic, and faradic.

Yes. The voltage of a medium galvanic dosage is 20 or 30 volts; a large static machine generates an E. M. F. estimated at about 80,000 volts per inch of space between the poles, or a maximum of a million volts with such apparatus as the author employs.

Why was it long and mistakenly reported to act only on the surface of the body?

The error arose out of "Electrostatic" tests on a brass sphere in 1806 in which a "charge" is shown to "rest" on the surface. (?) This proof (?) is like proving that a horse standing tied to a post stands still when he runs, for therapeutics does not employ "charges at rest" but currents in motion. The theory was long since demolished but compilers of electrical writings often repeat it.

What are the conditions of therapeutic administration of static electricity?

1. The machine must generate a full therapeutic dosage as demonstrated by test.

2. The currents must be accumulated by the aid of an insulating platform or by Leyden jar condensers.

3. The machine and atmospheric environment must be dry, as moisture conducts off the current and prevents the essential *accumulation*.

How is the machine dried?

By chloride of calcium placed inside the case.

Will the machine work well without this in the case?

No. Not when the weather is damp.

How can the air of the room be suited to the use of static electricity?

By keeping the windows closed against dampness and

by dry heat, as a grate, stove or furnace, or gas or steam radiators.

Are all types of static machines equally in need of dry conditions for therapeutic work?

Yes.

Is not a different statement made regarding Wimshurst and similar types as against the Holtz machine?

Yes. It is often said that they are not affected by dampness.

Will any good static machine work well every day in the year?

Yes, if the operator attends properly to the essential conditions.

But the same machine will generate more current in winter than in summer?

Yes, as a rule.

Why does it act best in winter?

The room is dried by artificial heat, the clothing and skin of the patient are dry, and the general conditions are more favorable than in hot weather.

What special electrodes are required for application of this current?

Electrodes with conducting ends of certain shapes and sizes, with long insulating hard rubber handles to which a chain is connected during treatment.

What are the methods of treatment with the patient insulated on the platform?

1. General electrification with selected positive or negative pole.

2. Potential Alternation (or interrupted charge) devised by Dr. Monell in 1893.

3. Sparks of many doses and qualities and administered with a range of technique of very great extent.

4. The Breeze and its modification, the Spray, the most varied and flexible of static administrations, after the spark.

5. The author's direct interrupted static current employing but one electrode in contact with the patient with the opposite pole grounded; a system of static technique that parallels the uses of the best faradic currents but goes beyond them in quality of therapeutic action.

What methods are used without insulation of the patient?

Leyden jar methods, which also parallel faradic work of all kinds but differ in respect to the greater voltage of the static current.

Can the static currents be applied to therapeutics by a greater variety of clinical methods than any other current?

Yes. It calls for more experience and variety of skill when its full value is demonstrated.

Is it not also true that it can be used and is used as a limited routine without any skill at all?

Yes. Just as a child can strike the keys of a piano without knowing a note of music, but that does not compare with the use of a piano by an artist musician. Not by any manner of means.

In order to obtain all and the best therapeutic aid from the static machine what is required of the physician who uses it?

He must make the same study of dosage, actions, tech-

nique, and the conditions controlling effects that he is obliged to make as a preparation to prescribing drugs.

Is that all?

Yes.

Why do so few give the same study to prescribing medical electricity that they recognize is necessary to give to prescribing drugs?

Past generations of medical students were not taught the facts in medical colleges.

Should every medical college teach the rudiments of medical electricity?

Yes. Instruction in therapeutics cannot be complete if it omits one of the very greatest of therapeutic agents.

How many varieties of modern static machines are now made?

Three. The Toepler-Holtz, the Holtz and the Wimshurts.

Which is the best?

The answer is specific and not general. Any one of these machines may be good, bad, or indifferent, according to its special workmanship, size, and individual output of current.

Are many static machines now made which are good as far as they go but which are too small to generate enough current for maximum therapeutic use?

Yes.

Does the name and size of a machine indicate its efficiency?

No. Nothing except an actual test of current output determines the efficiency of any apparatus.

Then if proper test proves any particular

Static machine to generate the large quantity of current required for effective clinical results, that particular machine is a therapeutic apparatus ?

Yes, this principle applies to all static machines.

Is the length of the Leyden jar spark a test of therapeutic current ?

It is only a partial test and tends to mislead those who are not experts.

May a static machine furnish enough current for very fair X-Ray work and yet fall far short of current for standard therapeutics ?

There are several thousand such machines in this country already, and more are sold daily.

What is the advantage of the static machine in medical and surgical X-Ray work ?

It is sufficient for the two purposes of exciting X-Ray tubes and treating patients.

Can patients be treated with an X-Ray coil ?

No.

Compare coils and static machines in medical and surgical X-Ray work ?

The coil is less bulky and a beginner may do something with it with less skill. Coils and static machines of moderate efficiency cost about the same. At the highest efficiency both also cost about the same, require about equal skill and will equally do the best work that has been so far demonstrated. The results that each will accomplish depend very much on the skill of the operator.

In X-Ray work with the static machine must the vacuum and construction of the tube be adapted to the apparatus ?

Yes. Crooke's tubes for Static machines were standardized by Dr. Monell in 1896 and are now made to suit all machines.

While beyond the scope of this brief compend for students where may the graduate who attempts practical work find full directions covering this branch of the subject?

In the "Manual of Static Electricity in X-Ray and Therapeutic Uses" by the author of this book.

ELECTRO-THERAPEUTICS.

It has been said that "enthusiasts" make "extravagant claims" for the medical properties of electricity; is this true?

It appears true to men who judge scientific electro-therapeutics from their experience with one cheap battery or none at all, just as the "extravagant claim" that inhaling ether would "annul pain during surgery" could be scoffed at by a man who judged ETHER from his experience in inhaling ammonia salts.

Are the assertions of advertising quacks about the cures of their commercial devices based on facts?

Some of them are based on the scientific demonstrations of skilled operators using scientific apparatus but they cannot be duplicated by quack devices. Other statements are simply reckless misrepresentations of the known properties of electric currents. Much of the swindle lies in asserting that a device with none of the requisites of high efficiency will easily surpass the effi-

ciency of the most efficient scientific apparatus in the hands of the best physicians. This is gross deception.

But have the real merits of high-efficiency electro-therapeutics ever been overstated by any reliable author?

No. They are much understated. They are often in some respects *mis*-stated, but it is difficult to put into words the full value of this agent when it is restricted to its proper uses and employed with skill.

In securing complete results in a given case may a physician be obliged to use more than one current and method?

Yes. In a great number of cases this is necessary, and it is also often helpful to combine another remedy with electricity.

Are most clinical reports based on the action of electricity alone, unaided by drugs?

Yes, nearly all such reports not only state the action of unaided electricity but for the most part are the action of a single current, so that in private practice the aid of other currents or remedies may often give better results.

In what great class of diseases does medical electricity best serve the physician?

Chronic diseases.

What are its limitations in acute diseases?

Indications which call for other therapeutic actions, conditions of treatment outside of the physicians office, and the practical efficiency of remedies more easily employed, properly direct prescribing to other measures.

Does this refer particularly to general febrile diseases?

Yes.

Has electricity often a valuable place in convalescence and in combatting the sequelae of these same diseases?

Yes, it can then be of immense service through alterative, tonic and nutritional actions that can be set up.

Do local acute processes often provide indications that can be well met by some therapeutic action of some electric current?

Yes, and in the office practice of an expert much can be done that is not feasible in house visits. The limitations of the remedy are in part the difficulties of its administration, which are much greater than the ordinary administrations of drugs although often less difficult than hydrotherapeutics, massage and surgery.

Why does medical electricity find its best use in the treatment of chronic conditions?

Most chronic cases respond less favorably to drug action than acute conditions; the indications are more within the scope of electro-therapeutic actions; cases will attend or office treatment or will enter a sanitarium where complete apparatus is available.

Is it also true that remedies will not reach many chronic local conditions through the circulation while electricity excels in the practical certainty with which effective action can be localized?

Yes.

Is electro-therapeutics rightly an ally or rival of drug therapeutics?

It is a valuable and friendly ally of all other remedial agents and will assist both physicians and surgeons to

give their patients results that often cannot be equalled in any other way.

In what follows regarding the clinical uses of electricity are the author's statements based on the unskilled applications of partial or single currents, or on the skilled use of all the manifold resources of every type of modern electrical apparatus?

They are based on the scientific prescribing of scientific electro-therapeutics in their entirety.

What are the special indications for the general systemic actions of rapidly interrupted medium induction coil and sinusoidal currents with selected dosage?

1. To stimulate the whole system, add to the sum of its vitality and enable it to eliminate disease or resist invasion.
2. To promote general nutrition and metabolism.
3. To quiet general nervous agitation.
4. To aid in procuring natural sleep without drugs.
5. To reduce the fever, restlessness and pain of acute inflammatory diseases.
6. To provide passive exercise of muscles.

Can local applications of the same currents supplement these effects by the further relief of local symptoms?

Yes.

What are the special indications for substituting the constant galvanic current in its systemic actions?

Conditions of "more profound depression of the cen-

tral nervous system" rather than simple functional derangements.

Does Static electrification afford effects which are similar to all three above currents in respect to nutritional, constitutional, sedative-tonic, or stimulating actions but in a varying degree?

Yes. The command of all these currents permits a selective choice in respect to quality of dosage and technique in the widest range of cases.

Is localized pain a special indication for the sedative actions of electricity?

Yes, the relief of pain is a most satisfactory part of current action with a proper selection of technique and dosage.

Will all currents relieve pain?

Any form of therapeutic electrical apparatus can be adjusted to deliver a quality of current that can be skillfully dosed to abate or remove pain, but it is not accurate to say in general that "electricity will cure pain." A novice will often aggravate when an expert will easily give relief.

Is the study of the control of pain one of the most interesting in electro-therapeutics?

Yes, and also of great practical value to the physician.

Name an important class of pains that are often best and most curatively treated with selected electric current actions?

Headaches.

If the headache is a symptom of any disease that is amenable to treatment by any form of electric current, will the prognosis be a radical cure?

Yes, if correct methods are employed.

If the headache is caused by some disease that electricity does not affect, may it abate or remove this symptom without reference to the etiology?

Yes.

If the head pain is due to an incurable lesion, which is an active and continuing cause, what results may be then obtained by the aid of some form of electrical application?

Palliation may often be of a better kind and degree, and last longer than that obtained by other measures.

What is the value of skilled electro-therapeutics in functional nervous diseases?

Selected methods of employing electric currents can be caused to exert most beneficial actions on the nervous system, and neurasthenia and functional neurosis constitute the greatest field in successful electro-therapeutics, electro-gynecology being next.

Are the "refreshing and vitalizing" effects of electric currents of special value in cerebral exhaustion and insomnia?

They can be made so by the competent selection of dosage and technique.

In all these states does not much of the benefit result from improving the patient's processes of metabolism and nutrition?

Yes.

In electro-therapeutic references to "nutrition," does the word refer to the mere taking of "nourishing" food, or to the ultimate processes of tissue change?

It is always applied in the ultimate sense. The complex "nutritional" influences of the local and general uses of electric currents are difficult for the student to fully grasp, and are best realized only after practical experience with many and various morbid states.

Is acute mental or physical exhaustion particularly amenable to the restorative actions of selected methods of electro-therapeutics?

Yes. Here electricity is the remedy par-excellence.

Do the various neuralgias offer a suitable field for electric current action?

Yes. So much so that when failure to cure occurs, the diagnosis or the method employed may be suspected.

Are selected electrical methods more satisfactory in the treatment of most neuralgias than blisters, cups, cautery, "rest cure," anodyne drugs, etc.?

Yes.

What is the chief cause of poor clinical results in the electric treatment of neuralgias?

Inferior and inadequate batteries.

If these so-called "cheap" batteries lose patients through poor results when good results are easily practicable, are they really "cheap"?

Cheap drugs, cheap surgical equipment, cheap food, cheap nursing and other cheap appurtenances of practice are no more disastrous to patients, than are batteries which are "cheap" in their essential construction and lack therapeutic qualities.

Many neurotic and other states are affected by changes in the weather; can the annoyances

of this susceptibility be removed by electrical treatment?

In the majority of cases it can.

Is Sciatica included in the neuralgias that are curable by electricity?

Yes. Certain painful states in the region of this nerve may, however, result from obscure or grave causes that take them out of the reach of electro-therapeutics. A selection of cases is necessary.

Is neuritis an indication for electricity?

It is an indication for selected current action which may be applied with benefit.

What is the value of electricity in neuritis as compared with other measures?

While certain cases are met by other remedies, yet when the principle of treatment is either "sedation" or "counter-irritation," these actions can be set up more effectively by selected electro-therapeutic dosage than by other means. This applies both to acute and chronic neuritis, a disease often too tedious under any form of treatment. Without skill on the part of the operator, patients are often tortured by wrong dosage and technique. Better let electricity alone in neuritis than use it to hurt the patient. But better learn to use it properly and avoid hurting.

Is locomotor ataxia a promising disease in which to employ electricity?

No, and yes. It may often be a boon even when the prognosis is bad.

What are the indications in this disease?

They must be considered with reference to the indi-

vidual patient, and in the course of the disease the state of the patient may vary greatly.

Would you promise to "cure" any case of locomotor ataxia?

No.

What would you expect to do with electricity if you knew exactly how to use it in a suitable case?

To relieve pains and symptomatic disturbances, and promote local and general nutrition.

Would you consider it a good average result for electro-therapeutics if the patient was kept fairly comfortable, and the progress of the disease held in check for a term of years without any regard to the question of "cure"?

Yes, if other measures had been carefully prescribed and failed to give these results.

Can it be stated that in skilled hands the resources of electricity are likely to give better results in a series of cases than other usual methods of treatment?

Yes.

What are the indications for selected electrical actions in muscular rheumatism?

To remove the pain, restore normal movement, and establish the healthy state in the muscle fibres.

Will electricity do this?

Almost infallibly in the great majority of cases if skilled methods are rightly employed.

Does this include lumbago and all forms of muscular rheumatism?

Yes.

Then if electricity is an efficient agent, it surpasses the numerous other recommendations of text-books for the treatment of this disease ?

No expert in the uses of electricity who commands all currents (and also as a physician commands all the usual resources of prescribing), attempts curative treatment with any other remedy than some form of electricity.

Is this remark true of acute inflammatory rheumatism ?

No. Electricity does not meet the indications in the general inflammatory stage, but when convalescence lingers and drugs need help, electricity will often rapidly finish the case.

Acute local inflammations which are not rheumatic sometimes leave stiff and sore muscles in their train ; can these be restored to comfort and action by electricity ?

When a simple liniment fails, the swift and certain remedy is a high potential current of electricity.

But in true arthritis, either sub-acute or chronic, has electricity any proper field of usefulness ?

If the joint or joints affected can be adequately reached by technique, it is likely that resolution can be more completely advanced by selected resources of electricity than by any other measures.

Are modern improved methods of applying the nutritional actions of high tension currents to the local nutrition of arthritic joints particularly valuable in gouty joints and in rheumatoid arthritis ?

Yes. In these rebellious lesions the author of this

book places electricity (employed by his special methods), at the head of the remedial measures.

What are the results in old, deformed and incurable cases?

Control of pain, immediate improvement in comfort, and progressive increase in use of the parts. The total gain will depend on regularity and length of treatment. Other prescribing is greatly inferior to electricity in these cases, in the observation of the present author.

Are the results equally good in chronic rheumatism affecting large joints?

No. The parts are not so adaptable to the contact of electrodes, and the direct action cannot be so efficiently concentrated where needed.

In obstinate chronic articular rheumatism is it desirable to supplement the action of electricity (if it is used), by prescribing drugs also?

Yes, and all other measures that will do the patient any good.

Can cases of gonorrhoeal rheumatism be benefited by electro-therapeutics?

Yes. Relief and improvement is advanced by selected current action. It is a valuable adjunct to the essential attention to the cause.

In all the above classes of diseases in which sub-oxidation is a factor, what can be said of the most modern currents of high-frequency and potential?

"They furnish general medicine with a new and valuable means of treatment, capable of modifying more or less profoundly the processes of nutrition through the

vasomotor system and exerting a powerful action upon all living bodies subjected to their inductive influence."

Can arthritis also be treated locally by drug cataphoresis with the galvanic current?

Yes.

Is chronic synovitis satisfactorily treated by selected methods of using electricity?

In most cases some form of electricity can be made the most efficient remedy. The "indications" should be followed in the prescription, or the state of the joint may be aggravated instead of helped.

Is the partial paralysis following joint lesions a special indication for electricity?

Yes. The indication also applies to joints and muscles that have been in splints after fractures, dislocations, etc.

Has electricity any therapeutic equal as a contractor of muscles?

No.

Is it then the chief remedy against paralysis?

Yes.

Is electricity a panacea for paralysis per se?

No. It is the most important single remedy for curable forms of paralysis, but it requires skillful prescribing with reference to the state of the muscle fibres and the character of the causative lesion.

Do the average results justify the reputation of electricity as an anti-paralytic?

No.

Why is there so wide a difference between the scientific efficiency of this agent and the way many cases turn out?

A common faradic or galvanic battery handed to a

nurse or to the patient with the injunction to "try electricity" will not attain a very high standard of clinical results. Scarcely any technique so simple in theory is so difficult in practice as the technique of treating paralysis. It requires a trained expert and often much patience.

Can the prognosis be fairly determined by an eletrical examination of the state of the fibres?

Yes.

Is early treatment an advantage in all cases whether of a curable type or not?

Yes. If all cases were promptly treated with correct methods there would be fewer "incurable cases."

In estimating the prognosis in cases of old paralysis what must the physician remember?

He must remember that the actions of electricity relate chiefly to "functions"—restoring the contracting function of muscle fibres and the motor and sensory functions of nerve fibres—and that it is not possessed of properties which will supply new nerve cells, remove a cerebral clot, repair the ravages of chronic cord inflammation, cut down excessive formation of connective tissue, or prevent mechanical pressure upon vital structures.

In the curable forms of peripheral paralysis is the prognosis affected almost as much by the long neglect of treatment as by the severity of the lesion?

Yes, in many cases.

What is the prognosis in cases of muscular atrophy?

Modern methods of electrical technique with more

efficient currents than were formerly in use have improved the clinical results.

What is the most efficient restorer of sensory functions of nerves ?

Sharp needle sparks of static electricity.

In old hopeless cases of neglected hemiplegia and paraplegia can electricity do the patient any good ?

Yes. Such cases as are unduly debilitated or suffer from pains and symptomatic disturbances may be given a great deal of comfort by a few weeks of skilled electro-therapeutics. It is not always necessary to ask if a given patient can be "cured," for many are incurable, but paralytics have other troubles to contend with and some of them can be removed.

For full information as to all forms of paralysis and proper electro-therapeutic technique, the student is referred to "The Treatment of Disease by Electric Currents" by the author of this compend.

In a lesion like Paralysis Agitans what can we expect of electricity ?

If the patient's general health is below par and the condition is thereby aggravated, the sedative-tonic and nutritional actions that can be procured from selected electricity will always afford the amelioration attendent on an improvement in health, and in some cases a good deal more.

Writers Cramp is a supposedly incurable affection; can it be improved by treatment with electricity ?

In his monograph entitled "The Cure of Writers Cramp and the Arm Troubles of Telegraphers and Ball

Players" the present author sets forth the nature and curability of these affections. Early stages are rapidly and radically restored; middle stages can be cured without unreasonable difficulty; when, however, the late stage of complete disability is reached and passed, the relief of any pain or distress is all that can be quickly accomplished. To restore the arm to full use then may be possible if the patient will keep up treatment for a year or more if less fails, but a cure is so difficult that the author of the successful methods prefers not to attempt the most severe cases.

Is electricity indicated in Chorea?

In the recent Choreas of children selected electrotherapeutics have been well tried and approved by competent observers. Cases which have not responded to the usual remedies have recovered after treatment with static electricity. The Guy's Hospital reports on this subject are historical, and the Transactions of the American Electro-therapeutic Association furnish additional evidence on this point. In the chronic Chorea of adults the prognosis is for the relief of certain accompanying symptoms and a general improvement without greatly reducing the Chorea. When special indications exist for any form of electrical treatment, it need not be withheld because the spasmodic lesion is not deemed "curable."

In the morbid mental states this side of the Insanities has electricity a useful field of action?

Yes. When the disturbing mental symptoms are dependent upon some physical disease of a curable nature, and more especially if they are the result of worry, overwork, excitement, grief, shock or alarm, or long contin-

ued loss of sleep, the beneficial actions of selected electro-therapeutics are pronounced. There is nothing equal to electricity to clear up the mind, brush away the cob-webs, or soothe it, re-invigorate it and re-establish its normal workings when these have been impaired by purely functional derangements. "Americanitis" is a name given to the hurry-worry-intensity of the American habit. "Don't worry clubs" are mentioned by the press, and many devious remedies are offered as correctives. The one remedy really indicated is most often some selected form of electric current. The neurasthenic state of mind that works too fast and worries over trifles is very often removed in a few seances of skillful Static or Galvanic electricity.

In the true Insanities has electricity a beneficial effect?

This subject is so important and so beyond the essential brevity of a compend, that the student should read at his future lesiure, the reports of cases in chapter XLIX of the author's complete treatise, entitled "The Treatment of Disease by Electric Currents." They have been proven valuable in sanitarium and hospital practice.

What may be expected of electricity in the treatment of Hysteria and its manifestations?

Static electricity is probably the most effective remedy in this neurosis.

What are three indications for static electricity in hysteria?

1. The improvement of the patient's general health.
2. The relief of symptoms.
3. A more or less permanent cure.

Does the treatment of hysterical subjects with electricity test the skill of the operator?

It is very likely to do so.

Is some form of electricity especially indicated in Spinal irritation?

Yes. It is the chief remedy.

Must a choice of current and technique be made to suit the case?

Yes. Coarse annoying applications will not give the expected benefit, and will lead the patient to oppose the remedy.

In the treatment of diseases of the alimentary tract, does medical electricity render any service that especially indicates its use?

Yes. When chronic cases fail to derive full benefit from the usual prescribing, it is often possible to reinforce the action of drugs and diet with selected actions of electric currents which will promote a cure.

In what classes of cases may this most often occur?

In cases in which the disturbance of digestion is symptomatic, reflex, or functional.

Are constipation, diarrhoea, colic, nausea, and pain all amenable to selected actions of the various selected currents?

Yes, providing the cause is removable.

What are the indications for electricity in constipation?

The desire on the part of the patient to have normal action of the bowels restored, and the failure to secure this end by medical prescribing.

What are the chief principles underlying the use of electricity in constipation?

1. The stimulation of the secretory glands, the nervous functions, and the muscular tissues of the gastric and intestinal apparatus.

2. The improvement of the functionation of the liver by reducing venous engorgement and increasing the arterial blood supply, thus influencing the secretions and nutrition.

Are these measures effectively carried out by proper electric currents?

They are very readily and effectively carried out with the proper apparatus and skilled technique.

Is electricity more speedy and curative in chronic or temporary constipation than extra-drug measures, such as massage, irrigations, special exercise, etc.?

It is far superior to massage and other extra-drug methods of treatment, but will not prove so with a cheap faradic battery in the patient's own hands.

What is required for the best results?

The superb results to be obtained in the treatment of all varieties of removable constipation are best witnessed in the office practice of electro-therapeutic experts, who are skilled in all the technique of galvanic, sinusoidal and static currents. A fine induction coil apparatus has practical uses, but is not employed when the other resources are at hand.

Is treatment painful or annoying to the patient?

In the author's hands it is not only not annoying, but in so far as it relieves distressing symptoms (if any are

present), it is a gratifying comfort. The correct methods may be considered perfectly satisfactory to all concerned.

May a cause for constipation exist that cannot be reached by means of an abdominal application?

Yes. This is one reason why the ignorant employment of electricity is so far from scientific. The trained expert takes into account the cause and all special indications, and does not simply make a routine attack on external muscle fibres.

What if the cause is an irritative lesion in the rectum, setting up spasm, or interfering with normal peristalsis? Can it then be reached by electro-therapeutics?

Yes. The rectum presents a number of conditions which are most easily and satisfactorily treated with selected electrical technique. Electricity is also often a useful adjunct to other primary measures when such are first indicated.

What particular form of so-called "dyspepsia" finds its chief remedy in the resources of skilled electro-therapeutics?

Nervous dyspepsia.

Is flatulent and intestinal dyspepsia amenable to treatment by electricity?

Yes. It only requires a proper selection of current, technique and dose.

Is electricity effective in gastralgia?

Many cases of visceral neuralgia have been relieved by electric currents. In all cases the physician should note the importance of diet and medical management,

and not attempt to use electricity as a sole remedy if others are needed.

Will electricity often relieve distresses and supplement the action of other measures in chronic gastritis ?

Yes. That is about all it can be made to do in such cases.

What would you say about electricity in the treatment of Cholera Morbus ?

When the patient is past the acute state and can get to the physician's office, the full recovery of strength and normal action is remarkably promoted by a few applications of selected electrical measures. The author has also abated the spasm and pain in a case that happened to be present in his house at the time of onset.

Does the same principle apply to cases of Cholera Infantum ?

Yes. As an adjunct to the proper measures usually employed, the additional aid of the tonic, restorative, function-regulating and strengthening actions of selected electric currents will do much to bring about a speedy convalescence.

Have such results been clinically demonstrated ?

Yes. The author has demonstrated them in a number of cases. One has only to read the physiological actions of electric currents to note how rational they are. The only requirement is correct technique with properly selected dosage and current action.

Has intestinal obstruction been successfully treated by means of the hydro-electric douche ?

Many times; and when other measures had failed and

the patient was too near collapse to survive operative measures.

Should this method be reserved as a "last resort" ?

No. Its simplicity and safety place it in the first rank of measures, and after it fails (if it fails), then more radical measures are properly in order.

"Are the facts and technique of this proceedure stated in recent electrical text-books, so that physicians can utilize the method when needed ?

Yes.

Is the hydro-electric douche useful in a variety of cases such as intestinal inertia with flatulent distention, arrested peristalsis following abdominal surgery, alternate constipation and diarrhoea, impacted faeces, etc.?

Yes.

Could you obtain any beneficial aid from selected electricity in enlarged liver and spleen, and in such cases of jaundice as do not yield to the usual methods ?

It has been possible in some such cases to relieve symptoms and to improve the functional processes by the aid of electricity when other measures had failed.

Is it rational to expect benefit to patients with chronic malarial cachexias through any of the resources of electric currents ?

Yes. Before the general use of quinine, Static electricity (the only current then in use), won a distinctive reputation as an anti-malarial remedy (1750--90). Even now the best results are to be obtained by supplementing

other treatment with static electricity when the patient can attend for office administration.

In the "tonic treatment" of syphilis and in chronic specific cachexias, is the general tonic and nutritional action of Static electricity indicated?

Yes. Patients of this class need Static, and it can be made an important adjunct to direct medication.

When pains and symptoms are relieved promptly by Static electricity and recur after treatment without the evidence of progressive influence upon the supposed lesion, what is the diagnostic significance of this fact?

It points to a cause either not previously suspected or not amenable to the actions of this current. The limitations of Static electricity should be carefully studied.

Referring again to cachectic and debilitated states of any kind, such as most often lead the physician to recommend travel or a change of climate, can the alterative and tonic properties of the author's method called "Potential Alternation" be made to give the patient about the same benefit at home?

It is more certain to do so than travel, which may cost much and disappoints many.

What can you state to be the present authoritative opinion as to the benefits of electricity in the treatment of epilepsy?

In so far as the individual is in poor general health, with depraved nutrition aggravated perhaps by the depressing effects of drugs, benefit may reasonably be expected from skilled static administrations. The seizures may

be reduced in severity and frequency. In cases associated with pelvic derangements the gynecological applications of galvanic and faradic electricity may also do much to improve the condition.

Will a general toning up of the entire nervous system be of value in cases that have long been on the bromides?

This is one of the great indications for the tonic actions of electricity in epilepsy and other "incurable" diseases. Some cases are apparently cured.

What ground is there for believing that skilled dosage and technique with selected therapeutic actions of electricity may be of service in the diseases which are collectively called "Brights diseases" and "Diabetes"?

Study of the pathology and character of the lesions thus grouped together with study of the physiological actions of certain electric currents under special conditions of administration show that the general indications for treatment find no other remedy adapted to meet them so well as static electricity in expert hands. Clinical reports confirm the theoretical value of this agent. If local indications are met as well as possible by other means and Static currents used for their constitutional actions and for symptomatic improvement, the best results will be obtained.

Does sugar disappear from the urine in diabetes mellitus when the diet is not especially restricted during static treatment?

The author has had such cases.

Are the annoyances of diabetic patients much lessened by the aid of electro-therapeutics?

More so than by any other measures known to the author.

Is the prognosis in chronic interstitial nephritis improvable by the aid of this remedy?

Yes. If the physician employs the proper methods with competent skill.

Are physicians generally aware that Static electricity is so valuable in these formidable affections?

No physician need remain unaware of the facts. They are published and republished at intervals so that all may read them.

In cases of "floating kidney" can palliation of pain, when it occurs, be afforded the patient by the aid of an electric current?

Yes. With the very greatest satisfaction.

We now turn to pulmonary affections. Is Asthma curable by any form of electricity?

Possibly.

Setting aside the question of "cure" and the acute attack, can we expect to decidedly improve the general asthmatic condition so that the patient is more comfortable and has fewer and milder paroxysms?

Almost certainly if the proper electrical technique is employed.

What cases of bronchitis can you benefit by static electricity and skilled technique?

A temperature case that is in bed is not an office patient, but all varieties and stages of bronchitis that can attend the office where apparatus is located can be decis-

ively improved by Static technique as taught by Dr. Monell.

Can Static electricity be justly called one of the first-rank remedies in the treatment of sub-acute and chronic bronchitis?

Every physician can make it so by learning how to use it to set up the indicated actions in the tissues.

Are the results the direct action of the current or do they depend upon definite technique?

They require precise technique and accurate dose regulation.

If pleurisy is the diagnosis will electricity meet the indications?

Dry pleurisy is effectively treated by electro-counter-irritation and such local technique as the given case may require. The pains of the chronic pleural involvement of phthisis are better controlled and removed by electricity than by any or all other remedies combined.

If the pain is pleurodynia will electricity relieve it?

Yes.

But the resources of the most scientific master of electro-therapeutics fail utterly to retard the progressive changes of pulmonary tuberculosis?

On the contrary when the therapeutic chain of the most hopeful measures has been prescribed with the utmost care, electricity will add another link stronger and more decisive than all the rest.

In every case?

No. Not in every case, but in the majority of cases not yet arrived at the stage of complete hopelessness.

Is electricity then to be considered a rational and effective therapeutic agent in the treatment of tuberculosis?

Yes, except in the acute miliary type.

Is it probably the most nearly curative of any single remedy in incipient and first stage cases?

Yes. It is then more decisively and speedily beneficial and more permanently palliative, if not entirely curative, than climate, diet, drugs and other measures which may be prescribed without its aid.

When you say this of electricity do you mean that the essential action of simple electrification is thus efficient in tuberculosis?

No. In order to procure the best clinical results there must be a special knowledge of the local and general indications for the efficient actions that can be produced by special technique. Correct technique and dosage will then produce the desired results.

Granted that correct treatment is administered, what may be accomplished for the patient under rational conditions?

By the aid of the author's methods of employing static electricity, we can omit opiate cough medicines which may depress and impair nutrition; we can set up local sedative actions which will lessen and soon remove all the irritative throat cough, and we can re-inforce the efficiency of the muscles concerned in the "drainage" cough, and enable it to clear the lungs at once of secretions that have collected in the night and keep the lungs free without effort during the day; we can, by other technique and dosage; set up other actions directly on the secretions themselves, so that they will gradually les-

sen in amount and become more normal in character, and no "expectorant" of the materia medica parallels this action in quality and degree. By other skilled applications we can next attack the respiratory muscles and strengthen them throughout so that they will largely increase the oxygen taken into the lungs, will carry on respiration at a much more normal rate and without pain or fatigue, and with control over both inspiration and expiration. Along with this improved oxygenizing of the blood we can next vary our technique to attack the digestive apparatus and directly improve appetite, digestion and the general nutrition of the patient; we can set up such special actions as may be indicated to relieve other symptomatic disturbances of almost all the kinds that affect these cases from pain to night sweats; we can especially remove the muscle-soreness and debilities, and in ten minutes a day provide the benefits expected from the many hours of mixed gentle exercises and "rest cure" now carried out in institutions, and with far more decisive results; if sleep has not already become regular and refreshing we can address yet other technique to its improvement with good effect; if the heart is weak or irritable we can soon act on its nerve supply with regulating and tonic effect.

Have these actions of properly applied electricity been so completely demonstrated in practice that they are indisputable?

Yes.

Will they be obtained by any physician who puts one or more patients at a time on the Static platform, and subjects them to simple "electri-

fication" with or without an "umbrella electrode" over their heads?

No.

What more is required?

If you place a patient on the operating table with surgical tools at his side, the results of a skilled operation will not take place though you let the patient remain near the tools for an hour. The principle is the same with electricity, and especially with Static treatment. Putting a patient in the circuit does not "treat" tuberculosis; it requires all the skill of expert technique to attack each tissue as it needs, and to meet every indication of either general or local nature.

Can the essential methods of the author be as efficiently employed in private practice as in institutions?

Yes.

If the patient is in what may be called the "pre-tubercular" state, or state of predisposition, or has a simple chronic bronchitis, what is the prognosis under static treatment by the author's approved method's?

Removal of the predisposing condition and restoration to normal health in less time than by any other measures (that omit electricity).

Can the pleuritic pains of pulmonary phthisis be so promptly relieved or so permanently removed by any other means as they can by the correct electrical technique?

No.

Is electricity a danger or a benefit in diseases of the heart?

A hammer is not a benefit if allowed to crush the user's fingers, but if directed to driving nails and its proper functions, it is one of the indispensable tools of carpentery. The same principle applies to the uses of electrical instruments and the currents directed through them. When indications are properly met by the physician there is no more useful cardiac remedy than is to be found in the physiological actions of electricity.

Can any of the resources of skilled electrotherapeutics be made to relieve the patient's anxiety, restore the nervous tone and assist in transforming irregularity of the cardiac function into a normal process ?

Yes.

But if the cardiac disease is a valvular lesion, what can you then say as to the possible uses of electricity ?

As remedial agent with a marked tendency to sustain and regulate the functions of the body, selected actions of certain currents enable us to make them probably the best extra-drug therapeutic measure in both organic and functional diseases of the heart.

Do electric currents prevent the use of any other treatment that will benefit the patient ?

No.

Does the rationale of successful treatment by the complete Nauheim (Shott) method differ essentially from the therapeutic actions that can be set up by selected technique with electric currents ?

No.

What is the basis of the author's advocacy of

proper electro-therapeutics in the treatment of heart diseases?

Convincing personal experience.

Can you name some of the indications for electricity in Orthoepedics?

1. General constitutional improvement of the patient.
2. Local alterations of nutrition.
3. Relief of pain and other disturbing symptoms.

Is there a large field of usefulness for electricity in Orthoepedic practice?

Yes. Much more than most physicians appreciate.

Does electricity serve as the auxiliary or as the principle remedy?

In different cases the indications may call for no other measure, while in other cases the major measures may be mechanical, surgical or medical, etc.

Name some of the conditions requiring electrical treatment.

The various forms of talipes, as equinus, calcaneus, varus, valgus, cavus, and their combinations, flat-foot, knock-knee, toeing in, weakness of various muscles, fibrous ankylosis and chronic arthritis.

Is electricity especially efficacious in sprains?

Yes.

After fractions and dislocations and the removal of splints, does the use of electricity hasten joint mobility and muscle strength?

It is indicated in every such case and has no equal as a restorative.

Can it also do much for the general health of the patient if this has been impaired by house confinement?

Yes.

Does lateral curvature of the spine come within the range of electro-therapeutics?

Yes. No other remedy is required in early stages.

Is it effective in old and neglected cases?

No. To correct deformity the patient must be treated at the proper time.

In cases of irritable disposition and physical cachexias associated with deformities, can electricity aid the mental state and modify the cachexia even if but little can be done for the deformity?

Yes. In most cases. A beneficial change can often be brought about in a few weeks.

What currents can be made to improve the nutrition of bones?

All interrupted currents of high frequency and sufficient voltage and amperage.

In a growing child with arrested development of a long bone, can growth be started and maintained by an electric current?

Yes. By proper technique and dosage.

Are indications for treatment in diseases of the eye often met by the action of electric currents?

Yes. Selected dosage and technique may render many kinds of service in diseases of the eye.

What is needed in order to afford the best results?

The skill of the Oculist combined also with skill in the uses of electric currents.

Can an Oculist without study of electro-thera-

peutic technique expect to obtain the results that electricity ought to produce?

No. No matter how skilled he may be with his accustomed instruments, he must learn to use the tools of electricity in addition if he treats patients with electricity.

In paralysis of the motor muscles of the eye, can the defect be remedied with satisfaction to the patient by means of electricity?

Yes, by careful control of the dosage the treatment is acceptable to both young and older children.

From the conjunctiva to the deeper structures there are a number of inflammations of the eye, some simple, some infectious, some destructive, some obstinate and incurable; will electricity supplement other measures with benefit to the patient?

Yes. In a general way it may be said that in the full resources of electric currents from the sedative static spray to cupric electrolysis, and including the whole range of galvanism and coils, we possess remedial measures that cannot be dispensed with in inflammations of the eye.

Is negative electrolysis a recognized proceedure in cases of stenosis of the lachrymal duct?

Yes.

In simple excessive lachrymation what will promptly dry the flow and regulate the secretion to normal?

The author's method of a concentrated sedative static spray.

Does it hurt?

In expert hands it is one of the most delightful forms of treatment.

After the removal of a foreign body from the eye, can the remaining congestion, irritation and spasm be almost instantly removed by electrical sedation?

Yes. The patient can leave the office with the eye feeling normal. It is much more satisfactory than a cocaine solution.

Do the usual measures of the Oculist approach the benefits of skilled electricity in Asthenopia?

No.

In all classes of functional debilities of the apparatus of sight, can the proper fitting of lenses and classical measures be valuably supplemented by the tonic actions of electricity?

Yes, to a most gratifying extent.

How about atrophy, neuritis, and grave lesions of the optic nerve, can they be helped by electricity?

In all such cases the patient should be given the benefit of doubt and nothing neglected that may hold out the most remote possibility of good. Some benefits may be obtained with electricity even when the case is hopeless that will justify its use. In careful hands it is not likely to do any harm, and its results can soon be determined.

Can a corneal opacity that obstructs sight sometimes be absorbed by the negative galvanic current so that sight is restored?

It has been done.

Is the osmotic action of the galvanic current

useful in absorbing an intraocular hemorrhage?

Yes.

Will electricity cure glaucoma?

Will any other remedy "cure" glaucoma?

After the use of mydriatic solutions in the eye for purposes of examination, can the patient be promptly given the comfortable use of the eye by the aid of electricity without waiting for nature to restore the normal state?

Yes, after the drug action passes its height the patient need not wait on "nature" to remove the effects of mydriasis.

Apart from the direct treatment of the eye, can patients whose eye states are associated with neurasthenia, general debility, headache and functional derangements of any kind be benefited by skilled electro-therapeutics?

Yes. An Oculist who does not prescribe selected electrical measures when they are indicated, must be considered behind the present age of progress.

How about electricity in the treatment of diseases of the ear?

The expert can do much more with electricity in the ear than the aurist can do without its aid, but the difficulties of the situation limit the technique and modify the results. It is not a brilliant field of electrical work.

What has been the main electrical resource of the nose specialist?

The cautery.

Has it been used to excess and often with secondary disappointment?

Yes.

When the cautery has been used, not for the destruction of tissue, but as a means of setting up a nutritional repair, are other electrical measures superior?

Yes, very much so.

May all stages of rhinitis, acute, sub-acute, chronic, hypertrophic, atrophic and ozoena be treated with electricity?

Yes, by an expert who knows how to do it. And also Hay Fever.

With what results?

With a better average of results than all other therapeutics can parallel.

But is a considerable variety of current action and technique required to make the treatment agreeable to the patient and secure the best results?

Yes.

Is electricity indicated in the local lesions of the pharynx?

In many of them it is an efficient remedy and is often indicated.

Without direct internal application can low grades of chronic inflammations and deviations of nutrition of the pharynx and larynx be successfully treated by electricity?

Yes. With a proper selection of current, dosage and technique, a curative action can be set up in parts that are inaccessable to an electrode and direct contact.

Name a common complaint that is effectively treated with electricity.

The throat strains and fatigues of speakers and singers.

Are hoarseness, partial or complete aphonia, and soreness from this cause promptly relieved by a skilled application of an electric current?

Yes. An acute case may sometimes be restored in a single treatment, and chronic cases benefit progressively.

Would students of vocal music benefit much by the aid of electricity?

Yes, if they were free agents, but they are rarely allowed to seek its benefits. The benefit is unmistakable, but teachers of the voice usually reject its aid, as they know nothing of its technique and value.

What can you say of the "tonic" effects of skilled electro-therapeutics in various states of debility?

As an adjunct to other measures, electricity interferes with nothing else that can be done for the welfare of the patient, and it adds the restorative action of one of the most effective tonic remedies known to medicine.

Could its aid be employed to rally the patient from a low state in asthenic diseases?

Yes.

Are the tonic actions of electricity of indispensable value during convalescence from all exhausting diseases?

Yes. The physician who fails to give his patients the benefit of this great restorative fails in his duty.

Are properly applied electric currents the prime and most speedy restorative in acute, mental or physical exhaustion from overwork or excitement?

Yes.

In the debilities of chronic invalidism and old age does electricity offer efficient aid to comfort, strengthen and prolong life?

Yes. If used with proper dosage and technique it is especially indicated in this class of cases.

"Shock" may result from many causes, and from the nervous depression of an overwhelming grief, calamity, exposure or fright the system may recover very slowly; can rapid restoration be usually brought about by the aid of selected actions of electricity?

Yes. This is one of the striking values of this agent.

Does dermatology offer a field for electrotherapeutics?

Yes. Grouping all the actions of all currents under one head, electricity is indispensable in the treatment of diseases of the skin.

Begin by stating some of the indications for its use.

Skin diseases which have their origin in neuroses or in dietetic and nutritional perversions need electricity to support other measures. The itch or pain of many cutaneous lesions can be well relieved by electricity. It can be made an effective cutaneous sedative, stimulant, or counter-irritant, with accurate localization, requiring only the essential apparatus and correct technique to direct the therapeutic action as desired. The local nutritional actions of electricity are beautifully illustrated in the treatment of all forms of ulcers, especially those that resist other remedies. Negative galvanic electrolysis and needle puncture remove many small growths with success. Eczema may be cured by

electricity alone, after much other prescribing has been done in vain. The small boils that come in persistent crops yield at once to skilled electricity when drugs fail to check them at all. Many cases of lupus have been attacked by electrolytic methods and the electro-cautery, but if the physician will discard these mistaken procedures and treat lupus properly with selected technique, he will find it superior to any other measure. The same is true of tuberculosis of the skin and of several other very obstinate lesions. The author has given several months of decisive palliation in a case of advanced epithelioma of the tongue when the patient was past operation and apparently within a month of the end. An account of the case is published in the " Elements of Correct Technique ", by the present author. Scrofuloderma call for electricity. Carbuncle, acute glandular inflammations, etc., may derive crucial benefit from proper electricity and the student should be prepared to use it at the right time and in a proper manner. For the excision of cancers of the uterine cervix the electro-cautery in expert hands is slowly winning the recognition it has deserved for twenty-five years. As the full use of electricity in dermatology requires all currents and particular skill in technique and dose regulation many limit their electrical work to " electrolysis " and the " cautery." The whole subject will repay careful study at length.

Can the reputable physician make valuable use of electric currents in the treatment of important genito-urinary conditions ?

Yes. The fact that charlatanism has cultivated this field does not bar scientific medicine out of it.

Is electro-tonic sedation indicated in so-called spermatorrhoea?

Yes. It can be made effective in most cases.

Can gleet and local ulcerated patches in the urethra be successfully treated by means of electricity?

Yes.

Are strictures "cured" by electrolysis?

Some can have their calibre enlarged satisfactorily by this method.

Can all strictures be remedied by either the usual electrolytic method or the linear electrolysis of Fort?

In theory, yes. In practice the theory meets difficulties.

Can the expert discriminate and select suitable cases only?

Yes.

What is the chief therapeutic agent in the treatment of functional debilities of the male sexual organs?

Medical electricity, employed with correct technique.

Is it a "sure cure"?

Before making a prognosis in any case it will be wise for the physician to gain some personal experience and make a full study of the electrical treatment of these patients. Skill may do much that seems incredible to the novice, while on the other hand, there is an old saying that "fools rush in where angels fear to tread." Skill in technique and conservatism as to prognosis will tend to the greatest satisfaction.

Can wasted testicles be enlarged and developed

by the nutritional actions of selected electric currents?

Yes. This is simple and gives brilliant results.

Does enuresis yield readily to electrical treatment?

Many cases have done so, but not every case can be treated by crude apparatus and no knowledge of technique.

Have severe cases of tubercular orchitis been benefited by electricity?

Yes.

Is negative galvanic electrolysis with puncture effective in hydrocele?

Yes.

Can anything be done with electricity in either acute or chronic cystitis?

Skilled specialists with expert technique can do something in these cases to relieve pain and symptoms and improve the condition, but the non-expert had better use other measures alone.

In the acute prostatic congestions of men not old, can pain and congestion be readily abated by means of electrical sedation?

Yes.

May electricity be made an efficient palliative in the enlarged prostates of old men?

Yes. From simple sedative applications to the electrocautery there are so many resources in electric currents in the treatment of prostatic conditions that they can be made to meet some of the indications in almost every case. Those who think differently will be liable to alter their views if they make a full study of the records.

Are hemorrhoids often treated by any form of electricity?

The cautery is often used; the clamp and cautery current.

But is negative electrolysis not also indicated in certain cases?

It will remove hard lumps left from treatment by injections.

Has cupric electrolysis also been mentioned in the treatment of soft hemorrhoids?

Yes.

Can any other form of electrical treatment meet the indications in simple recent hemorrhoidal congestions and irritations?

Yes. The author's special rectal electrodes combining mechanical dilatation with a high-frequency sedative current, are very efficient.

Can rectal strictures, ulcers, and fissures all be satisfactorily treated by selected electrical methods of various kinds?

Yes.

Is electric sedation particularly useful to remove peripheral irritation in the retum?

Yes.

Can almost any ordinary case of prolapsus obtain relief from the same electrical actions of the muscle fibres that are applied to the treatment of muscular atony or paralysis elsewhere?

Yes. It only requires the proper current, dosage and technique.

Does the treatment of the Uterine diseases of

women now constitute one of the most useful local fields of electro-therapeutics?

Yes.

Will you please make a concise general statement of the status of modern electro-gynecology?

Electricity has demonstrated its title to rank first among safe, efficient and conservative remedies, and its methods of employment have been placed upon nearly an exact basis. Many of the problems of the transition period of gynecological electro-therapeutics have been settled by improved apparatus and definite principles of dosage.

So true is this that no physician or surgeon who treats the diseases of women can now do full justice to his patients without the help of electricity. *The benefits which can be produced by simple and agreeable methods speak for themselves* whenever they are witnessed. In many cases the patient is promptly relieved without inconvenience, confinement in bed, or troublesome restrictions upon her daily habits, when in similar cases other remedies and methods of treatment supported by eminent authorities are irksome, full of trouble, often associated with suffering, and often end in unsatisfactory results.

An electric current which will almost infallibly conquer subinvolution and chronic metritis is certainly valuable. The means of restoring strength to weakened supports of the uterus, of correcting recent displacements and removing the effects of chronic alterations is a practical boon to patients. And so we might go on, omitting all that can be said of the uses of electric currents in rare and grave lesions, and confining our remarks to cases in

every-day practice—cases of functional neuroses, of pain, congestion, inflammation, hemorrhagic conditions, amenorrhoea, versions, flexions, sub-involution, prolapsus, minor lacerations, and atonic states, with associated anaemias, neurasthenias, dyspepsias, headaches, backaches, and the wide range of symptomatology which suffering womankind presents—we find that in galvanic, high-tension induction coil, and static currents we often possess the most practical means of relief within the domain of medicine. If these electric currents possessed no other power than their demonstrated ability to improve nutrition, dislodge pain, control hemorrhage, and afford prompt, grateful and lasting symptomatic relief in a score of obstinate pathological conditions, we should say they were indispensable in office practice . . . . It is only when general and local prescribing and electric currents join friendly hands and supplement each other that the best clinical results are attained.

The attention of reputable physicians, who have women for their patients, is directed to the very great value of electricity when properly applied with proper high-grade apparatus.

To bring about the manifold and complex benefits above alluded to, does the physician need more than a $10 faradic battery and a pair of "sponge handles"?

Yes. The author describes twelve chief varieties of technique employed in his practice and covering the uses of all scientific currents. The indications of these cases call for certain actions of each different current and a complete equipment is required for the best work. The most complete directions for electro-therapeutic treat-

ment, covering the pelvic diseases of both men and women, will be found on pages 238 to 644, embracing 22 chapters of "The Treatment of Disease by Electric Currents," a book written by the author especially for the guidance of general practitioners. In this work will be found exact directions for the selection of current, electrodes, technique, dosage, etc., together with other explicit information that is designed to enable the physi cian to treat his patients from its pages. The above work also contains clinical directions for the electro-therapeutic treatment of every disease mentioned in this compend. Instruction is written in plain terms that the beginner can understand and with reasonable study prepare himself for the demands of practice.

THE END.

"The Author's Chief Work."

The Treatment of Disease by Electric Currents

By S. H. MONELL, M. D.

DETAILED directions are given for the selection of current, choice of poles, application of electrodes, regulation of dose, duration and frequency of treatment. Every chapter is a clinic in itself.

The author presents every essential fact in plain language that can be understood. No other work upon electro-therapeutics has appeared in which directions for treatment have been so plainly given. The great strength of the work is its complete representation of the therapeutic uses of all three great medical currents in office practice. The section devoted to gynecology is exceedingly valuable and complete. Genito-urinary affections in the male are considered at length. Nervous and chronic diseases are treated with great detail. No attempt is made to exhaust the entire capabilities of electricity, but in every case in which it possesses practical clinical value its uses are described so that it can be employed by the reader as the author directs.

The volume is marked throughout with the author's well-known practical idea of treatment. The book *is devoted to treatment, and the means of making treatment successful.*

Every practitioner should order it.

This book contains 1100 pages; size, octavo; binding, extra cloth, gilt. Price, net, $7.50, postpaid.

E. R. PELTON, PUBLISHER,

19 East Sixteenth Street, N. Y.

AN INDISPENSABLE BOOK.

First Edition Sold in Two Months. Third Edition Now Out.

MONELL'S MANUAL

OF

Static Electricity

IN

X-Ray and Therapeutic Uses.

The First and only complete exposition of this subject ever published. Fully illustrated.

IT gives complete directions for practical X-ray work. . . It gives explicit directions for the treatment of every patient who can be benefited by static electricity. The book does not contain any theoretical discussions but is replete with up-to-date, progressive, practical information which every physician and surgeon desires to know.

Monell's Manual contains over 600 octavo pages, comprising fifty seven chapters, of which one is devoted to a complete analysis of the *physiological* action of static electricity, three to *therapeutic technique* and *dose regulations*, five to *instructions* for obtaining the *best X-ray effects*, and the remainder to *clinical practice*.

Among important clinical chapters are those devoted to the treatment of rheumatic diseases, rheumatoid ar hritis, chronic gout and the uric acid diathesis, neuralgias and neuritis, neurasthenias, chronic functional nervous diseases, chorea, hysteria, pain, brain fag and insomnia, functional and organic heart diseases, headache, diseases of the skin (two chapters), chronic or

sub-acute inflammatory conditions within the thorax, morbid mental states (an invaluable and original chapter), chronic cachexias, debilities of the aged, paralytic diseases, writer's cramp, dyspepsia and functional derangements of the alimentary canal, locomotor ataxia, static electricity in gynæcology (one of its most useful spheres).

Both *indications* and *contraindications* for the employment of different methods of treatment are stated in full.

To the medical profession, and especially to all employing the static machine and who have waited so long without an authoritative work upon the subject, this book is a mine of essential information.

"This useful volume is one that every physician and surgeon who is interested in the medical applications of electricity should possess. It is the only work of the kind in the language, and as a pioneer production is remarkably complete in its details and thorough in its descriptions. To one who has neglected the study of this phase of medical science, the great results described, and the multitude of ailments that can be benefited will prove quite a revelation."—*American Medico-Surgical Bulletin.*

"Within the past few years there has been a remarkable increase in the use of the static machine, and one of the foremost in advocating and popularizing its use in the profession has been Dr. S. H. Monell. He has also forced the recognition of the static machine as a means for producing the X-ray, and that against determined opposition. A visit to his office gives no indication of ostentation or exaggeration, but convinces one that he is moderate in his claims, and has accomplished what he has, by hard work and unremitting attention."—*Cleveland Medical Gazette.*

Price, postpaid, $6.00.

E. R. PELTON, PUBLISHER,

19 East Sixteenth Street, N. Y.

New book by the Author of "Treatment of Disease by Electric Currents."

ELEMENTS OF CORRECT TECHNIQUE.

By S. H. Monell, M. D.

CONTENTS.

Introduction.—**Technique defined.** The Value of Skill. About Apparatus. *Chapter I.*—**Galvanic Studies in Technique.** How to Acquire Practical Skill; A Series of Home-Clinics, covering all general and local methods, with special reference to the great factors, Pressure, Resistance and Rate of Change; Author's Principles of Scientific Dose Regulation; Personal Tests; Cataphoresis. *Chapter II.*—**Faradic Studies in Technique.** Induction-Coil Currents made clear—Qualities explained; Practical Tests to Develop Skill; Accurate Dosage; Important Methods; Author's Original Demonstrations. *Chapter III.*—**Studies in Sinusoidal Technique.** Sinusoidal Currents Explained; Systematic Tests for Clinical Uses; Author's methods; Scientific Dose Regulation; Place of Sinusoidal Currents in Electro-Therapeutics. A series of indispensable Home Clinics. *Chapter IV.*—**Galvano-Faradic and Galvano-Sinusoidal Currents.** An Original Study; Principles of combining Currents from two separate batteries; Relations of Voltage and Amperage; Clinical Tests; Chief Uses of Combined Currents; Dose Regulation; Qualities; Proof of Action. *Chapter V.*—**Static Electricity.** Studies in the Author's Technique; Summary of Static Methods taught by the Author; Systematic Personal Tests for Skill; How to Train the Ear, Eye and hand of the Operator—Principles made clear; Author's Original Instruction in Scientific Dose Regulation; The Art of Artistic Technique; How to Become Expert; Treatment of Consumption; Author's Electrodes, with Use of Each. A Series of Home-Clinics designed to make a Skilled Operator out of a Novice; Supplementary to all other writings of the author on this subject. *Chapter VI.*—**List of Special Methods.** Chief Methods for Use in Electro-Gynecology; Author's Complete Methods in Functional Sexual Atonies, Debilities, and other Deviations from Health; Chief Non-Surgical Uses of Electricity in Eye, Ear, Nose and Throat Pathologies. *Chapter VII.*—**Cancer of Tongue.** Decisive Palliation with Static Electricity; A Clinical Record Setting forth Results. An Important Contribution to the Treatment of Malignant and Non-Malignant Ulcerations. *Chapter VIII.*—**A Plunge into Electro-Therapeutics.** A Chapter with a Moral; Crossing the Rubicon; Progress is Made; The Wisdom of Experience; Psychic Electricity; The Moral.

This volume contains 320 pages; size octavo; binding, extra cloth, gilt. Price, net, $2.50.

Sent by Mail or Express on Receipt of Price.

E. R. PELTON, PUBLISHER,
19 East Sixteenth Street, N. Y.

A Book every Student of Electricity needs.

PREFACE

TO

"ELEMENTS OF Correct Technique."

By S. H. Monell, M. D.

After four years of teaching physicians how to acquire skill in electro-therapeutic technique my general missionary work in this field ends. Henceforward the teaching that I do will be confined to my personal methods of employing static electricity, which take this great agent from out the rut of routine abuse and make it an instrument of scientific precision and of extraordinary utility.

As a substitute for my clinical instruction, this book is designed to furnish physicians a series of practical Home-Clinics and personal tests of current action which will transform the novice into an expert with reasonable study. Much original information is also added.

This manual is supplementary to my other books and covers other ground. It teaches the physician to explore electric currents at home. Much of the matter in these chapters is not in print elsewhere and is not included in either clinical or correspondence instruction at present. Accurate selection, precise dose regulation, approved methods, the art of artistic technique, progressive efficiency, and superior therapeutic results, are placed at the command of the careful student of this book.

S. H. MONELL.

NEW YORK, September 20, 1900.

Any of Dr. Monell's books may be ordered from the publisher, or obtained through dealers in electrical apparatus.

Extracts from Reviews of "The Treatment of Disease by Electric Currents."

"When Professor Monell issued his work upon static electricity, it was taken up by the medical profession as few books upon electro-therapeutics have been, and almost from the day of issue became the work of reliable reference with not only multitudes of general practitioners, but also with the specialists in this line of medicine, and especially with the medical teachers of America. When the announcement was made some weeks ago that a general work upon the entire subject of electricity in medicine was in process of preparation by Dr. Monell, a stir of interest passed over the profession, and the mere announcement that the work has now been published will bring for it a very large sale. The work stands forth as one of the most striking medical productions of 1897."—*Medical Sentinel.*

"To the average medical man this volume will prove a revelation of a most remarkable kind. While all have a general knowledge of the fact that electricity can be used to great advantage in some diseases, but few are aware of the vast scope of usefulness it can subserve. We could not in the short space allotted to us for this review give a tithe of the names of complaints benefited by this mode of treatment according to the author. His enthusiasm, too, is contagious, for as the reader proceeds he is unconsciously carried away into believing without seeing. He is a clear, forceful writer, and puts his subject before the reader in a way that cannot be misunderstood. His directions are all examples of perfect lucidity and just such as the practitioner needs when beginning the study of so fascinating a subject. The work of a good static machine and of a family battery is absolutely as incomparable as the medical advice of an Olser with that of a savage. This book should be in the hands of every person interested in electro-therapeutics."—*American Medico-Surgical Bulletin.*

"Every page of the book is *practical therapeutics.* Every chapter is a clinic in itself. It is a book that physicians have long desired, and is the first work upon the subject which presents in a single volume the special and comparative merits of all forms of medical currents. To the practitioner who seeks to inform himself of therapeutic development for consultation purposes, or for personal use of electrical apparatus, this volume is practically indispensable."—*The Medical Brief.*

"Another extremely valuable work on electro-therapeutics has been launched by the same author as the recent publication, 'Manual of Static Electricity in X-Ray and Therapeutic Uses,' which has attracted world-wide reputation thus early for its clearness of description and usefulness to the general practitioner."

"It would be impossible for us to specialize the headings of the seventy chapters in this volume in the space allotted for this review, therefore it must suffice to state that every known modern employment for faradic, galvanic, and static electricity, and their therapeutic indications, are detailed in this volume with *conciseness of language and minute direction of application* so that the general practitioner who runs may read and understand."

Brief Extracts from Reviews of "Manual of Static Electricity."

Electrical Review: "The book bristles with fresh and reliable facts."

Medical Sentinel: "The author is one of the most illustrious teachers of electro-therapeutics in America, the founder of a school in this branch of the art of medicine, and the present volume at once becomes a standard work on the subject treated."

Pacific Medical Journal: "The Medical profession is indebted to Dr. Monell for the first scientific work which has appeared on static electro-therapeutics and the X-Ray."

New York Medical Journal: "Certainly, the reader will find within its covers a large amount of information, which, so far as our knowledge goes, is not obtainable elsewhere."

The Lancet, London, England: "It is the most important book in the English language on modern applications of static electricity to therapeutics."

Brooklyn Medical Journal: "To say that Dr. Monell has supplied a long-felt want but feebly expresses the value of the contribution. It is in many respects unique, and comes at the right moment."

The Charlotte Medical Journal: "Every statement made by the author is conservative and moderate in tone, and is supported by actual experience."

Buffalo Medical Journal: "This volume is the only exhaustive work so far published on the application and benefits to be derived from static electricity."

American Medico-Surgical Bulletin: "It is the only work of the kind in the language, and is remarkably complete in its details and thorough in its description. It will prove a revelation."

The Times and Register: "The work is one of great value, and should stand out prominent as one of the great additions to medical and therapeutical literature of the day."

Eclectic Medical Journal: "The author of this book has so thoroughly treated the subject that all the information needed by the profession for its use can easily be obtained by perusing its pages."

The Journal of the American Medical Association: "The careful technics given by the author will give new ideas to many."

Medical Record: "To those desiring information in this branch the author gives his views in a clear and masterly manner. He has had abundant experience here, and the work is to be commended for its treatment of this interesting subject."

The Medical Fortnightly: "The minute and careful description of apparatus and methods, together with the vast amount of practical clinical suggestions, gives to Dr. Monell's work a unique and valuable place in medical literature."

The American Medical Journal: "This book will be sought after by many."

The Atlanta Medical and Surgical Journal: "The work is truly interesting and instructive. We are prepared to accept the author's statements, knowing the marvellous static current as we do."

British Medical Journal: "There is much good matter in it."

The Pacific Record of Medicine and Surgery: "This manual is a necessity to every physician or surgeon who seeks information on the subject."

Canada Medical Record: "The book is one of great interest and replete with information. From such a practical observer and teacher as Dr. Monell one must accept his results as from one qualified to dictate."

The Medical World: "Dr. Monell has done wonders with static electricity."

The Canadian Practitioner: "It is the only exhaustive treatise on static electricity that we are acquainted with, and we congratulate the author on the clearness of his descriptions and the easy style in which the book is written."

The American X-Ray Journal: "The work is written in a most attractive style. It is scholarly, vigorous, and confident. It is the only book in any language exclusively upon the subject of static electricity, and the inventive genius of the author has slipped the cog of time, making the world his debtor."

The American Homeopathist: "Dr. Monell is unquestionably master of his subject."

"Probably no book on electro-therapeutics—and we say it conservatively—has ever equalled this volume for value to those of the profession who would use electricity as a therapeutic agent, and he who does not use it at this age is certainly not up to the times in his profession.

"We therefore heartily recommend this volume to our readers, believing that they will not be disappointed in adding it to their libraries."—*Medical Times and Register.*

"The general practitioner wants his information condensed as much as possible. The volume before us is clearly and simply written.

"It may be said that on the whole the volume before us is written in a more temperate spirit than usually prevails when the subject of electricity is treated, and it will prove a safe and useful guide to the general practitioner."—*Maryland Medical Journal.*

"Dr. Monell has given us a book that is eminently practical as a guide to the student of electro-therapy. It is based very largely on his own work and experience, and is to a high degree common sense, not only in practice, but in theory; that is, it is truly scientific in that it rests therapeutic principles on the present well-known laws of electric constants and the varieties of action on tissues. The present volume is complemental to the author's work on static electricity, and the two form the most complete and practical exposition at present existing of the subject of electro-therapeutics."—*Cleveland Medical Gazette.*

"Dr. Monell, the author of this work, is an inveterate worker and prolific writer. It is only a few months ago that it was our privilege to receive his large work on 'Static Electricity in X-Ray and Therapeutic Uses.'

"One cannot in a brief review more than hint at the scope of the work, so numerous are the points discussed. The indications for the use of the various currents of electricity and the results that can be obtained have now reached such a condition of exactness that we must now regard this means of treatment as having wider application than any other.

"When one sees how much can be written on a single therapeutic agent like electricity, it excites wonder to know why it is not more generally used by practitioners generally. Readers of this book may become versed in all the technical uses of this potent remedy, and cannot fail to catch the enthusiasm which characterizes this author's work."—*Canada Medical Record.*

"We find in this volume a condensation of facts which physicians have long sought in vain. Dr. Monell has cleared away in a few pages the perplexities that have befogged the source of knowledge. The quibbles, the confusion, the vague meanings which have hitherto characterized electro-therapeutic literature are here wholly unmasked—the subject being treated with the plainness of the Anglo-Saxon tongue."

"The book abounds in commonplace similies which are used for the purpose of imparting accurate meaning and setting aside all ambiguity and doubt. In every paragraph the reader finds something new, and so easily does he grasp the thought that with hours of reading he does not tire."

"The author betrays a familiarity with the subject not equally enjoyed by any other writer. The writing is essentially Monell. Every sentence bristles with the evidence of self-conviction won by labor, experience and thought. His language is simple, pure and rich. This book marks an essential feature, in that it makes no claim whatever in its teachings, but simply states the demonstrated action of electricity."

"Medical men can find in this book all that they need of the physics and physiology of galvanic, faradic and static currents. The author has simplified the method of teaching by a clinical course. Individual cases, including almost the domain of pathology, are used subjectively. How to obtain the current, the nature of current, the pole used, duration of each seance, changes to be looked for, and all practical methods are taught with the conviction of pure clinical teaching.

"The book is essentially practical for the doctor, and should be studied until he becomes familiar with every detail. The index is alphabetically arranged, and is full and complete.

"The volume was given to the profession just at the time it was most needed. This is the beginning of the electrical age in which electro-therapeutics is making such conquering advance. This book is an index of the progress of the medical profession."
—*American X-Ray Journal.*